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AVIATION WEEK

A McGRAW-HILL PUBLICATION

Designers Study
Temperature Effect
On B-58 Hydraulics



Piper Comanche

Comanche Stable, Rugged in Evaluation

OLD External wrenching wastes space



NEW NO Clearance required with INTERNAL wrenching



NOTE:
On over design tube design, bolts can
be set closer to adjacent surfaces
making possible increased and lighter
frames and lighter tube spacing.

waste space out of your design picture

SQUEEZE
with KAYLOCK

All-metal self-locking nuts.[®]

Internal/external wrenching Hex Nuts

USE OF—Internal/external wrenching Hex Nuts

- Strengthens points of potential fatigue failure.
- Saves material, space and weight.
- Eliminates wrench damage to surrounding material.

Make use of these weight, space, and cost saving features by incorporating KAYLOCK Internal/External wrenching self-locking Hex Nuts in your designs.

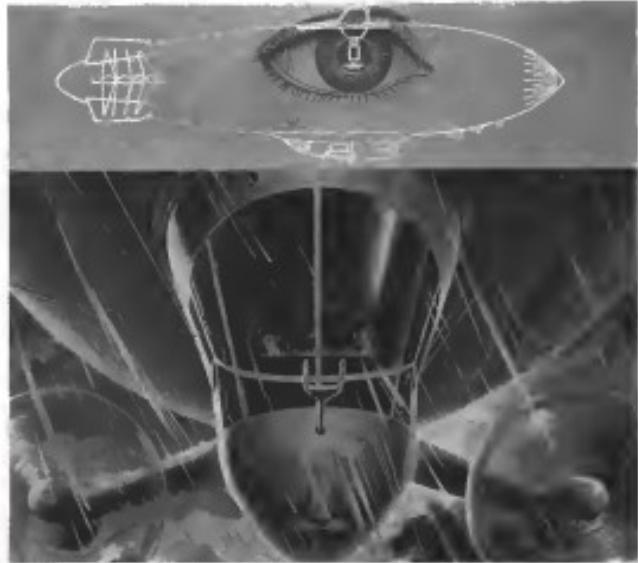
Kaylock Hex Nuts conform to all three Air Force-Navy standards: AN6404, AN6405 and the new low height National Aircraft Standard NAS479.

Complete line of Kaylock illuminated self-locking nuts available in steel or corrosion-resistant steel.



Catalog sent on request—

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General Distributor: Alvinco Corp. Ltd., Montreal, Quebec



They scan the sky with an
ALL-SEEING EYE

Carrying the longest radar antenna ever built, the airship can guard our sky and sea approaches for days and nights in end-through snow, wind and rain—without refueling or landing.

Only the airship can do it.

Developed by Goodyear Aircraft for the U.S. Navy, this flying sentinel can seal our skies against the danger of surprise attack. For its giant radar antenna affords a sensitivity and scanning range unmatched by other airborne drivers.

Moreover, its capacity for riding out

the weather with minimum crew fatigue makes the airship unique among aerial vehicles.

Proud Naval aviators recently maintained their radar posts for ten consecutive days and nights—through the worst Atlantic storms in 15 years.

And the airship has other important advantages. It's sturdy with fast. It's adaptable to a wide range of operating conditions. It provides greater flying comfort for the crew.

Most important: it can do an effective job with fewer units than any other type of airborne early-warning vehicle.

To the U.S. Navy and the Continental Air Defense Command belongs much of the credit for development of this modified Goodyear ZY-G-1W airship. In the years ahead, millions of Americans may sleep better because its crews are alert and on guard.

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Alton, Ohio, and Ditchfield Park, Arizona
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Amweld® Hits Your Cost Target

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Whistle-blowing. Lukt enkele arbeidsmisdrijven die plaatsvinden in de arbeidsmarkt. Voor deze reden moet het belang van rechtvaardigheid en integriteit voor alle betrokkenen worden gewaarborgd.

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400 BROADWAY, NEW YORK, N.Y.



AMERICAN WELDING
The World's Largest Manufacturer of Welded Boxes

AVIATION CALENDAR

- Mar. 11—Plates in Atmosphere—National Research Technical Conference, Society of Plastics Engineers, Hotel Ambassador, Los Angeles.

Mar. 12—11-March 1972 International Symposium and Exposition (Dawn Holdings Corporation), Hotel Atlanta, Georgia.

Mar. 11-19-May 1972—International Air Safety Seminar, Flight Safety Foundation, Falls Lake Gold, 15th Aviation Walk Safety Annex, Atlanta, No. 1000 Peachtree Street NW, Atlanta, Georgia 30309, U. S. A.

Mar. 12—14—National Electrical Manufacturers Association Annual Convention, Transco Hotel Atlanta, Ga. N. J.

Mar. 12—13—Second Annual Hydrogen Conference, Park Plaza Hotel, New York City, sponsored by Pechiney Inc. (see 1970 issue of *EH*).

Mar. 15—16—Mid-Valley Electronics Conference—Unisys Laboratories, Kenosha, Wisconsin.

Mar. 15—16—The Society of Technical Writers and Editors' 16th annual convention, David Stotesbury York, N.Y.

Mar. 14-May 1—Annual Convention, National Association Underwriters, Hotel Plaza, Dallas.

Mar. 14—Networking on Various Images—organizing representative professional groups on Telecommunications Equipment, Broadcasters, Broadcasters Union, Bell Telephone Co., N.Y.C.

Mar. 14-20—In Conforming & Reliability—International Association of Engineers, Chicago, Ill.

Mar. 15-22—Third National Electrical Mfg. Association Annual Meeting, Denver, Phillips Electronics Center, 700 S. Florida Ave., Mt. Vernon, N.Y.

Mar. 15-18—Winter Camp in Arctic and Antarctic by DCI Designers' Council, Inc., 1100 Connecticut Ave., N.W., Washington, D.C. 20036.

Mar. 18-20—Hydrogen Conference, Inter-American Institute of Technology, San Jose, Costa Rica.

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BABY AND TWEEN

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新編全蜀王集

A stack of business cards from various aerospace companies, including Boeing, North American Aviation, McDonnell Aircraft Corporation, and Lockheed, all featuring Clemco Aero Products, Inc. as a customer.

AVIATION CALENDAR

[Continued from page 5]

McMillan, Knott, Angus Dethomas and Manufacture Assn., Shear-Cutter Hold, Detroit

25-Decade of Defense Meeting, An American, Los Angeles, Calif., U.S.A. on Dec. 12

26-Annual Membership Meeting At Imperial Inn, Studio Hotel, Washington, D.C.

25-26-Annual West Coast Design Conference, Hotel Elks, Glendale, Calif., U.S.A.

25-Annual Annual Society, annual meeting Hotel Statler, New York

14-16-Japan Exporter's Showroom Exposition, Hotel Statler, New York

26-Annual Meeting, American Frame Shippers and Packers, Philadelphia, Pa.

45-Symposium on high temperature, ultra high temperature steels in aircraft engines, Naval Air Materiel Center, Philadelphia, Pa.

9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-59-60-61-62-63-64-65-66-67-68-69-69-70-71-72-73-74-75-76-77-78-79-79-80-81-82-83-84-85-86-87-88-89-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-109-110-111-112-113-114-115-116-117-118-119-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-159-160-161-162-163-164-165-166-167-168-169-169-170-171-172-173-174-175-176-177-178-179-179-180-181-182-183-184-185-186-187-188-189-189-190-191-192-193-194-195-196-197-198-199-199-200-201-202-203-204-205-206-207-208-209-209-210-211-212-213-214-215-216-217-218-219-219-220-221-222-223-224-225-226-227-228-229-229-230-231-232-233-234-235-236-237-238-239-239-240-241-242-243-244-245-246-247-248-249-249-250-251-252-253-254-255-256-257-258-259-259-260-261-262-263-264-265-266-267-268-269-269-270-271-272-273-274-275-276-277-278-279-279-280-281-282-283-284-285-286-287-288-289-289-290-291-292-293-294-295-296-297-298-299-299-300-301-302-303-304-305-306-307-308-309-309-310-311-312-313-314-315-316-317-318-319-319-320-321-322-323-324-325-326-327-328-329-329-330-331-332-333-334-335-336-337-338-339-339-340-341-342-343-344-345-346-347-348-349-349-350-351-352-353-354-355-356-357-358-359-359-360-361-362-363-364-365-366-367-368-369-369-370-371-372-373-374-375-376-377-378-379-379-380-381-382-383-384-385-386-387-388-389-389-390-391-392-393-394-395-396-397-398-398-399-399-400-401-402-403-404-405-406-407-408-409-409-410-411-412-413-414-415-416-417-418-419-419-420-421-422-423-424-425-426-427-428-429-429-430-431-432-433-434-435-436-437-438-439-439-440-441-442-443-444-445-446-447-448-449-449-450-451-452-453-454-455-456-457-458-459-459-460-461-462-463-464-465-466-467-468-469-469-470-471-472-473-474-475-476-477-478-479-479-480-481-482-483-484-485-486-487-488-489-489-490-491-492-493-494-495-496-497-498-498-499-499-500-501-502-503-504-505-506-507-508-509-509-510-511-512-513-514-515-516-517-518-519-519-520-521-522-523-524-525-526-527-528-529-529-530-531-532-533-534-535-536-537-538-539-539-540-541-542-543-544-545-546-547-548-549-549-550-551-552-553-554-555-556-557-558-559-559-560-561-562-563-564-565-566-567-568-569-569-570-571-572-573-574-575-576-577-578-579-579-580-581-582-583-584-585-586-587-588-589-589-590-591-592-593-594-595-596-597-598-598-599-599-600-601-602-603-604-605-606-607-608-609-609-610-611-612-613-614-615-616-617-618-619-619-620-621-622-623-624-625-626-627-628-629-629-630-631-632-633-634-635-636-637-638-639-639-640-641-642-643-644-645-646-647-648-649-649-650-651-652-653-654-655-656-657-658-659-659-660-661-662-663-664-665-666-667-668-669-669-670-671-672-673-674-675-676-677-678-679-679-680-681-682-683-684-685-686-687-688-689-689-690-691-692-693-694-695-696-697-698-698-699-699-700-701-702-703-704-705-706-707-708-709-709-710-711-712-713-714-715-716-717-718-719-719-720-721-722-723-724-725-726-727-728-729-729-730-731-732-733-734-735-736-737-738-739-739-740-741-742-743-744-745-746-747-748-749-749-750-751-752-753-754-755-756-757-758-759-759-760-761-762-763-764-765-766-767-768-769-769-770-771-772-773-774-775-776-777-778-779-779-780-781-782-783-784-785-786-787-788-789-789-790-791-792-793-794-795-796-797-798-798-799-799-800-801-802-803-804-805-806-807-808-809-809-810-811-812-813-814-815-816-817-818-819-819-820-821-822-823-824-825-826-827-828-829-829-830-831-832-833-834-835-836-837-838-839-839-840-841-842-843-844-845-846-847-848-849-849-850-851-852-853-854-855-856-857-858-859-859-860-861-862-863-864-865-866-867-868-869-869-870-871-872-873-874-875-876-877-878-879-879-880-881-882-883-884-885-886-887-888-889-889-890-891-892-893-894-895-896-897-898-898-899-899-900-901-902-903-904-905-906-907-908-909-909-910-911-912-913-914-915-916-917-918-919-919-920-921-922-923-924-925-926-927-928-929-929-930-931-932-933-934-935-936-937-938-939-939-940-941-942-943-944-945-946-947-948-949-949-950-951-952-953-954-955-956-957-958-959-959-960-961-962-963-964-965-966-967-968-969-969-970-971-972-973-974-975-976-977-978-979-979-980-981-982-983-984-985-986-987-988-989-989-990-991-992-993-994-995-996-997-998-998-999-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1098-1099-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1129-1130-1131-1132-11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American Nuclear Society, Section of Mechanical Engineers, Atlantic City, New Jersey, U.S.A.
 17-29-18-187 Nuclear Congress organized by American Institute of Chemical Engineers, 73 W. 36th, New York 18 N.Y.
 24-26-Fifth International Institute on Steel, Caen, Calvados, Normandy, France
 17-18-KFR-CN-5 Radiation, (World War II) Toronto Canada Council C.B. St. Georges, Chestnut, 175 South Broad Street, Toronto 3
 17-18-Institute of Transuranium Elements, Second Annual Technical Meeting, New York Hotel, New York
 22-24-187 Electrical Components Conference, Atlanta, Georgia, Appleton, Wisconsin, U.S.A.



Upstream!

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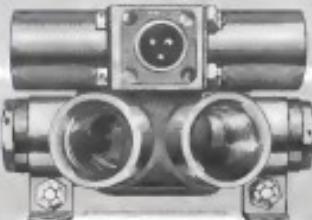
... first in Titanium



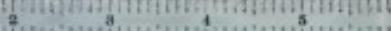
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Type I & II Sys. (-65°F
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Operating Pressure Range:
250 to 2000 Psi

Total Pressure Drop:

60 Psi at Rated Flow

Internal Leakage:

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Solenoid Continuous

Duty, Bridge Dry Coil,
18 to 28 Vdc operation at
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Compared with
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Temco's target drone "Teal" takes to the air
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The XKBS-1, "Teal," designed and developed by Temco in a low-cost, expendable target system, recently made its initial flight to become the navy's first successful rocket-operated target drone. Launched (left) and recovered by its FIM-92D Defense Eagle at 26,000 feet, the "Teal" held a straight course for almost eight minutes—the first eight of such duration for a drone using solid-propellant fuel. Also, the event was the first successful test-firing involving a solid propellant explosive aircraft.

Capable of operating near the speed of sound at altitudes up to 30,000 feet, the "Teal" will serve as a target for

air-to-air missiles and other defensive devices carried by Navy aircraft. It is a Temco development from initial concept to flight readiness, and an excellent example of Temco's engineering and production capabilities.

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matic and. The new JT-3 Tachometer Indicator uses the Aer. Torque principle, utilizing MIL-S-5247TA. Here is another Norden-Ketay advance that is part of the overall integration of engine instrumentation display. These new advantages extend the aircraft designer's capabilities in achieving higher standards of performance.

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Write for Bulletin 44-4 containing data on avionics, flight instruments, telemetering, electronic components, and aircraft instruments. Write: Norden-Ketay Division, Instrument & Systems Division, Wiley Green, Milford, Conn.



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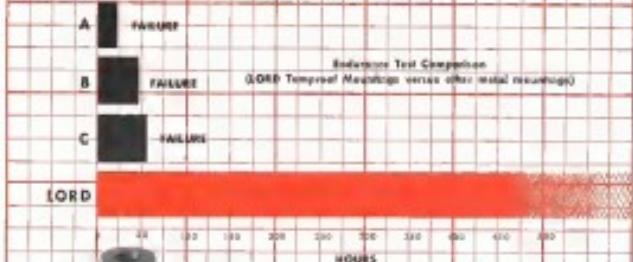
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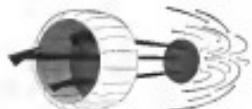
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9 HOURS



Diagram 9-12



Diagram 9-13



Diagram 9-14



Diagram 9-15



Diagram 9-16



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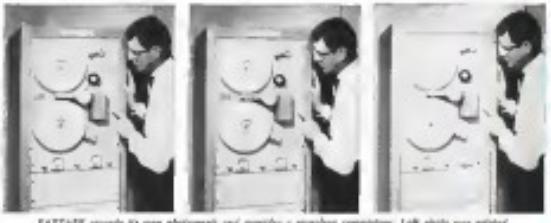
674

How the Queen's picture kept its charm Introducing "FAXTAPE" — facsimile on magnetic tape

We were entirely in accord with the British and Canadian points of view. Her Majesty's visit to Canada deserved special effort...which meant, from an amateurish-phased beginning at magnetic-tape facsimile recording.

To demonstrate phone-line news photo of the occasion, Ampex delivered FAXTAPE recorders

to Canadian Overseas Telecommunications Corporation's Vancouver office. By recording pictures of the queen onto tape, GOTEC was prepared for transmitting to overseas or to valuable loss of quality—desirable for any subject—over twice as far for the Queen.



FAXTAPE records its own photographs and provides a marvelous compression. Left photo was printed directly off the facsimile wire. Center is the photo after being recorded on tape and reconstructed. Right is the same photograph after being reconstructed the conventional way at a Photocopy point.

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Ampex's FAXTAPE is as familiar as Videotape is to television. It records the electronic signals used in picture transmission. Tape playback reproduces selected voltage patterns representing the picture and for feeding a transmitter to make a negative or print.

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For news photos, weather maps, documents and military data, picture quality no longer demands synchronous transmission to all receiving points. From tape a second-generation facsimile is as good as the original. Even a third or fourth tape generation is entirely acceptable.

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Tape of FAXTAPE may look like electronic pictures. You can scratch it, smash it, spend it up, shave it down, cover the picture, page the solution, or feed it off to a computer—subject only to the limits of human ingenuity. Any ideas?

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FIREBEE: "ENEMY" JET OVER AMERICA

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The Firebee flies at the high speeds and altitudes required to test the performance of the newest, most deadly air-to-air and ground-to-air missiles. It possesses the maneuverability and extended duration needed to realistically simulate "enemy" intercept problems.

Developed by Ryan for the Air Force (Q-2A), Navy (KDA-1) and Army (CM-1), the Firebee is in volume production and operational use

It is being fitted with special radar and infrared reflective devices for simulating varied target characteristics and providing broader missile-target compatibility. The Firebee can be equipped with wing pods to carry added fuel, a warhead, photo or television reconnaissance gear.

The Firebee is an example of Ryan's skill in blending advanced aerodynamics, jet propulsion and electronics knowledge to produce a highly successful solution to a complex aviation problem... meet a vital military need. Other examples are the Air Force Ryan X-12 Vertijet and Navy-Ryan AN/APN-67 automatic navigator for global jet flight.

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November 11, 1967

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EDITORIAL

Newspapers Discuss Secrecy Issue

Following are daily newspaper editorial comments on the issue of government secrecy raised by the "off-the-record," locked-down-down remarks about Aviation Week by Robert Cutler, Special Assistant to the President for National Security Affairs, and Loyd Wright, who headed the Commission on Government Secrecy [AW Nov. 4, p. 28].

Unfair

Washington Post and Times Herald

It is a good thing that the House Government Affairs committee is going to investigate the reported assault made on the great work of Aviation Week magazine because it showed that the United States had been unable to track Soviet missiles.

No investigation could have been necessary, however, if Robert Cutler, President Eisenhower's Special Assistant for National Security Affairs, had made no charges that he had to make on the record. There is something about secret assaults upon the conduct of conduct that is repugnant to those who believe in absolute standards of honorable behavior. When such accusations are supposed to be made openly, it is particularly deplorable when persons engaged in the conduct of government business are asked to speak of their kind squared up with whom they are charged. Such items cloud the charge, cast an enormous and dangerous shadow over the object of all an opportunity to settle an answer.

Mr. Cutler is well known as an advocate of the most extreme kind of secrecy about government operations. Whether the national situation has called more from the public ignorance he has fostered or from the difficulties of publication he dislikes might make a good topic for debate. The source of that dispute aside, the only honest reason for Mr. Cutler was to put open the record of his secret and private assault upon the good name of the affairs of a publication who lived as much right as Mr. Cutler to deserve their reputation for honesty and probity.

Careless Use of Nasty Word

The Milwaukee Journal

The magazine, *America's Watch*, reports that Americans today expect or demand help keep tabs on Soviet Russian atomic bombs.

Loyd Wright, who headed a presidential commission on government secrecy, about three or four days ago disclosed his views on "scrubbing the records." He knew his plan for a law he wants to read authority to purge the disclosure of classified secrets.

Robert Cutler, President Eisenhower's assistant on national security matters, almost followed the Senator into equal apoplectic rage. Almost followed the Senator into equal apoplectic rage. He said the agency disclosed "most" who kept them secret before, some of the nation's biggest subcontractors and defense producers the other day in fact he called it "treason."

Why the brouhaha? Because, apparently, the American people were not a "secret." It's a secret because the laws, of course, The Russians kept the T-33s laws. But the American people didn't know it—even though it's their duty. And telling them becomes "treason." Apparently a person who goes aประเทศ of truth to the American people and themselves to distract them pointed shoulder under the neck—a hole in the chest of the Administration is a minor.

This is partly because one of a series, *Washington Times Herald*, it can be applied to those who merely say something the Administration would prefer not be said, what strong enough words can be found to apply to some of the going-on in Washington?

What word is strong enough to label our obvious defense bungling? What word to describe the refusal of our leaders to tell our people truths that have long been apparent to everyone else in the world? What word to brand the administration which Administration spokesman—nay-sayers are holding the Presidency to cover up some of the hard truth of the world?

Truth, the others seems to be, is a fine thing for everyone but Americans. Daddies, in fear of the Administration, will decide that Americans can hear and what they should believe and the gap will be widened with ourselves from Abolition and right-wingers from Dick, Island. The truth will be clear and clear of Americans stand still very long for that sort of thing.

Washington Calling

By Morgan Childs

St. Louis Post-Dispatch Syndicate

What Washington looks about is a picture rather than a negative news agency. When Aviation Week magazine broke the story of American color bombs in Turkey, there was indignation in the Administration; the measure being that even through the Russians knew this, they could not go to the Turks with an official complaint.

The defense is pre-emptive warfare is always under a gun nowadays. It is not too far to accept the position, but time is slipping.

. . . Fears Public Disclosure

The Hartford Courant

Special Presidential Assistant Robert Cutler derives a terrific retort from his superior, Mr. Cutler, on how the nation's security above. His reaction, however, to a secret magazine article that told the American people something they had a right to know, suggests that Mr. Cutler may have suffered from myopia. He is often, after a servant of the people even in the military, a special appointment and powerful by influence and status.

Mr. Cutler, reports have it, objected violently to the disclosure by Aviation Week that the United States had a long-range nuclear set in Turkey monitoring Soviet missile tests. The magazine disclosed its sources fully in making the public. It proved out that the Russians were fully aware of the act, and that the only way was the disk, was the American people. Most, however, were more than that the Administration had much more information on Russian missile programs than it had allowed to be printed. (Continued on p. 36)



Massachusetts Institute of Technology, Cambridge, Mass., took this photo of an F8U-1 in flight.

CHR seals assure top aerodynamic efficiency of F8U-1

Boron covered silicone rubber airframe seals provide low friction, abrasion resistant surface, — 100°F to 350°F flexible.

Gaps between moving and stationary parts of an aircraft structure create areas that can seriously reduce aerodynamic efficiency. Sealing these gaps — or "airseams" as they are called — is an important means of improving aircraft aerodynamic losses. Sealing these gaps also compensates for tolerances due to flight stresses and production variations.

Aerodynamic sealing is used extensively in Chance Vought's F8U-1 Crusader fighter aircraft. Boron covered silicone rubber airframe seals are used in the fuselage, tail fin, and fabric-covered ailerons and rudder surfaces. Molded silicone rubber surface seals are used on the wings and on the rudder. CHR provides these seals for Chance Vought and mounted on the design drawings.

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E. C. Erek, vice president, Aero Manufacturing Corp., and president of Astro-Carrier Divisions, Cincinnati, Ohio.
Gerald C. Schubell, senior vice president, Electro-Mechanics, Inc., Buffalo, N.Y.
Robert W. Oberman, vice president research and engineering, Texas Instruments Inc., Dallas. Tim F. D. Walker, national Milt Olson as general manager of the Industrial Components Division, Dallas.

F. D. Robins, vice president, Columbia Turbine-Transformer Division of General Electric, Schenectady, N.Y.

Roger Lloyd, vice president, Kelvin-Hughes Co., Chelmsford, Mass.

John Newland, manager, Defense Electronics Division, Bureau of Defense Services Administration, U.S. Department of Commerce, Washington, D.C. G. M. Naar, president and board chairman of National Lampoon, Inc., Atlanta, Ga., and John Gwynn, Jr., chairman of the board, Atlanta, Ga.

Col. Charles R. Brown (USA), 1st adjutant general assigned to the president, NSA Corp., Princeton Park, N.J.

Charles R. Stroop, general vice-president-customer service, American Airlines, Inc., Chicago.

Honors and Elections

Frank P. Ross, Jr., president of General Dynamics Corp., has been elected a board member of the National Industrial Conference Board, New York City.

Frank D. Frost, a director of Bellistic Memorial Foundation, Long Beach, Calif., has been named a 1968 World Achievement Award Honoree-Awardee for his article rating best treatment of business.

Changes

George P. Ross, chief engineer, The Garrett Corporation's Aerospace Aviation Div. in Los Angeles, Calif.

James F. Brown, manager West Coast operations, Compton, Calif., has been promoted to senior manager, Compton, Los Angeles Division, Dow Glass.

Robert M. Feltz, manager marketing services, General Electric Co., Research and Development Department, Cleveland, Ohio, has been promoted to manager sales, Philadelphia, Pa.

Bob Gia, William L. Everett (USA), and manager-aerospace marketing, Electronic Division, Stromberg-Carlson division of Gen. Elec. Divisions Corp., Rockville, Md.

Mark K. Koenig, manager, Marketing Materials Analysis, Goodyear, Akron, Ohio. Robert D. Hayes succeeds Mt. Kisko as factory manager.

Edmund R. Thompson, technical advisor for rotors, research, Reliance, Inc., Melville, N.Y.

Maurice C. Hause, manager, Spaceflight Environmental Laboratory of Bedford, Inc., Bedford, Inc., Los Angeles, Calif.

INDUSTRY OBSERVER

► Use of insulation trials left by aerospace aircraft and missiles in low frequency antenna being studied by Federal Telecommunications Laboratory under Naval Research Laboratory contract. Insulating materials high electrical conductivity of these antenna paths. Problem in insulating so the trial is said to have solved, but frequency range not known. Present interest interests decrease rapidly as efficiency drops below 50%.

► North American Aviation Inc. has gone to capsule configuration for high performance aircraft designs. Philco has carried out a F-108 long-range interceptor and WS-108A chemical bomber design. Capsule missiles. Goodrich investigation last is entirely a North American design.

► Range of 3,000 m. gain in California University's Geostationary Digital Radar (GDR) against an intermediate ballistic missile by USAF officials (AVN Sept. 30, p. 25) may be an optimum-condition figure with effective range closer to 2,000 m. Field evaluation of GDR principle as General Electric HPS-47 missile detection system in Texas and Florida is reported to provide desired data at effective range much varying due distances and targets.

► Major plan for North American X-15 hypersonic research vehicle will be a Boeing 8-32. Indenture set, but plan will be held until X-15, major airline trip inside this own nucleus rather than have entente, says in air.

► Farade research vehicles recently built at Edwards had stability spans of five feet per second improved by first stage cluster of four Thielert Rocket motors.

► Allegany Ballistic Laboratory has developed a solid-propellant rocket with an overall specific impulse of 285 seconds, about 40% better than most types.

► North American Aviation has submitted plan for production-life licensing facility for student test students in conjunction with its proposal for the WS-138A chemical booster. Sandwhich plays major role in design makeup of WS-138.

► McDonnell flying crane shows that use of the month with 1.5-ton capacity can be carried inside a Lockheed C-130 without dimensions. Large 10-ton payload flying crane could be carried in a C-130 by being taken apart for loading.

► At least two of five E-2Bs (NSM-64) which North American Aviation is to deliver after USAF cancellation of the Nomad ASW-64 project have option of a range of about 500 m. against a goal of approximately 1,100-1,500 m. (C-8, SM-64). And Nomad's cousin which has been flown, was to have been fitted with a three-hundred booster developing 405,000 lb thrust from alcohol fuel.

► Douglas Vanguard lag behind Konstant satellite launching, project managers still feel reduced success rates for an expensive Vanguard rocket version in use of the most sophisticated test. Guidance tested in Test Facility 1, Goddard Space Flight Center, Greenbelt, Md., was successful in TV-1 and General Electric first-stage engine tested in newest TV-2 found all high degree of success, although they were first-stage engines. TV-2 firing is believed to be the first time a U.S. first-stage nozzle engine ever was to intercept on an orbital flight.

► North America's new-angled Novair intercontinental missile project made some major contributions to state of the art. Among them: major design refinements in the integrated planes of longrange missiles development of extremely accurate gross, design, development and construction of high thrust rocket engines and boosters packages. Projects also helped solve most of the serious problems of bringing along a complete high performance rocket system, which was developed in cooperation with Convair Wright.



TRAJECTORY ABOVE has been proposed to give missile evader planes maneuvered range or more. High velocity (above Mach 5) and high temperature reentry indicates that a vehicle shaped approximately like an ordinary shell is more feasible for the entry profile than the conical shells required wings to lead. The X-24 research aircraft will follow a similar flight path over a much

shorter range, its relatively low speed will enable it to pass through the initial entry and pull-up phase safely. With ICBM and IRBM weapons, launching, intercept and reentry pullup might have to begin low to prevent reentry heating and insulation from destroying warheads made of current materials. Once in the atmosphere the warhead can maneuver to evade defeating missile

Ballistic Missile Has Glide Potential

Doubled range for IRBM, ICBM evasion capability are possibilities drawn from data in NACA reports.

By J. S. Ritter, Jr.

NEW YORK.—New theories presented by ballistic missile experts at a meeting in New Haven on the behavior of hypersonic (over Mach 5, or more than 3,000 mph) vehicles indicate that the range of existing IRBMs can be extended by as much as 1,000 to 3,000 miles and may make ICBMs capable of evading missile defense above a target continent.

Screen Problems

This is not to underestimate the problem of detecting hypersonic entry and glide vehicles. It involves extremely complicated interactions of atmospheric heating levels and rates, mass rate of the complete vehicle, wings, fins, pointed guidance fins. However, the problem has been defined for some time and such methods are considered feasible with today's knowledge.

In the U.S. analysis of the theoretical work with glide warheads has been done at the Ames Laboratories of the National Defense Commission by Astronomers H. John Allen and Alfred J. Eggers, Jr., Ames Laboratory members who played a prominent part in the effort to solve the problems of rapid reentry

and missile avoidance. Between 1950 and 1955, the Ames laboratory had been established, before the first test was conducted, to study the effects of reentry on the performance of missiles.

Their work, supported by the

along a steep ballistic path, have also had some value in NACA investigations of reentry and glide techniques.

Thus NACA studies are an extension and refinement of the World War II reports by Egon Sanger and Bruno Bierig in Germany. A number of important suggestions based on this work by the Germans have been made in Western nations for vehicles which can convert great speed rates, great range. Principal exponent of the Sanger-Bierig proposals has been a vice technical director of the aerospace heating problem.

Sanger's basic idea is similar to the present Soviet-British studies of the Western projects are. In view of the competing needs the Russians have made of other German ideas it is only reasonable to assume that they would attempt to improve the effectiveness of their ballistic missiles by developing the reentry and glide techniques.

The use of these techniques will greatly complicate the problem of anti-missile defense, considered to be a very formidable problem under any current status.

Most suggestions for the anti-missile defense of the U.S. rely on establishing the trajectory and range of an ene-

emy missile somewhere between its maximum altitude and its impact point. Once the rigid trajectory had been established, however, as the target was moved, interceptors or the target were would launch distance missiles, based on the hostile warhead.

Aerobrake firing would probably be restricted to lead on angles because present computing and radar equipment is generally considered to be able to determine the angle of attack at a large number of ranges with the use of speed of an ICBM warhead. Whether this lead data a high kill probability can only be achieved with a lead-on attack and even then several defensive missiles would probably be launched to ensure a kill.

Defensive Measures

To foil these defenses, theorists now visualize an ICBM warhead penetrating a hostile aerobrake system, then re-entering the atmosphere around its lead-on missile well down its target. Upon reentry, pounds over an ocean area, the warhead could change direction and approach the target at an altitude of less than 25 miles and an average speed of about 10,000 mph. The ability of this type of warhead to maneuver on this approach to the target through the atmosphere is considerably more difficult to predict than the point of no penetrability for current nuclear guidance and computing systems.

A report presenting the basic theory and discussing the present problems of hypersonic vehicles has just been released by the NACA. This report TN-494 entitled "A Comparative Analysis of the Performance of Long Range Hypersonic Vehicles" was written by Egon Allen and Stanford D. Nunn. It discusses the vehicles fall into three categories in terms of range:

• Ballistic vehicles which follow a parabolic path from launch to impact.



HYPERSONIC theory shows that warheads reenter the NACA region above base 1000 deg. when only slightly less than a flat plate (see Mach 5. Stability is provided by lateral force on the nose section. Defining position of the flat panel after contact. Note a slightly rounded to reduce local heating.



ARMED of wings will compound heating problems. Required constant lead would provide reduced weight which again would increase heating, necessitating more coolant. The total velocity would drop up markedly before the cycle is completed and an optimum winged configuration is reached.

• Slab vehicles which are launched along a ballistic path and split reentry one hour or two hours later, hook into space in another ballistic trajectory. This path requires a stored skipping of the outer.

• Glide vehicles which travel at best 10,000 mph in a straight line.

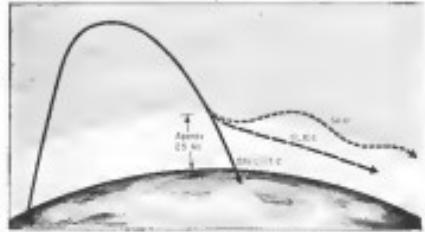
The NACA authors compare the efficiency of the three types by calculating the vehicle each requires to deliver a given payload over a given range. From

Efficiency Compared

The day when a flying robot laboratory and a ground-based test facility will be used to test different kinds of vehicles in the same way that the ballistic missile is related to the other types is the same that it requires the greatest velocity at the nose of powered flight in return a given range. Increased velocity requires a greater total weight and the basic associated with the day.

The ballistic vehicle survives its flight by employing a very blunt high drag shape. To expand a large portion of its kinetic energy at a minimum drag ratio than is feasible here. Glide vehicles are able to maintain a relatively low surface temperature by reducing a large fraction of their heat back to the atmosphere even though they have a low porosity and create a larger thermal gradient.

Linear travel in the atmosphere is the best vehicle from taking the much advantage of radiation cooling. The surface temperature, therefore,



RESEARCH GOAL is to prove ballistic with the skip or glide trajectories. NACA considers the skip path preferable with current knowledge and materials. Ballistic glide combination is possible if launch and entry angles are low. The nose merge of ballistic flight but can greatly increase total heating.

most considerable, making it impossible for conventional structures to withstand the high temperatures, in the view of the NACA.

The glide vehicle was found to be superior to the ballistic vehicle in the ability to convert velocity into range by lifting ratios at +6 or more. The best configuration for obtaining the highest efficiency at speeds above Mach 5 is considered to be a modified cone. Wings would be eliminated because of the severe heating problem they present; load would cause the surfaces contact load and generate a severe weight penalty.

Theoretical Studies

Lifting ratio, surface temperature, contact load and total weight are clearly related. For example theoretical studies with cones at hypersonic speeds indicate that for a lifting ratio of 4 the surface temperature would be about 1,100° F., and if one of 6 it would be about 1,000° F. Both temperatures can be lowered by using better materials and structures, but the greatest load would stay, so would total weight cost, etc. This is typical of the design optimization procedure.

The substantiation of a glide vehicle of modified cone shape can be effected by flying the windtunnel. Pitch and roll control can be accomplished by deflection surfaces of the fixed surfaces.

None of this type of glide vehicle would be maneuverable to acquire land-holding conditions at this separation point.

Cone type configurations are adequate as long as the vehicle impacts at a speed of about Mach 5 or greater; if the vehicle must land intact, more severe problems are introduced into the design.

Difference in Trajectory

The NACA report is presented on a basic manner and many omit the unpreserved portion of the flight. The glide vehicle is considered to begin its flight at the upper limit of the atmospheric or horizontal altitude. The ballistic vehicle levels itself into space in an elliptical path after its initial boost-out.

The idea of maintaining either the ballistic or non-ballistic path in ballistic and glide at the end of Stage 1 is flawed,

however. Thus, while Dornberger, Kraft, Ehrcke and others have worked at

able under certain conditions. The main requirement in these conditions is to reflect the heat from the body of the vehicle to the vehicle's interior, so that the reflected pool-up angle will be low and heating and thermal loads reduced. The lifting/ratio load and dimensions of the second vehicle is also a major consideration.

A safe conclusion from the information is that increasing the range and load by the ballistic trajectory of conventional vehicles is not feasible at high speeds unless the vehicle's interior does not change the lift-to-drag ratio, so that the increased pool-up angle will be low and heating and thermal loads reduced.

The lifting/ratio load and dimensions of the second vehicle is also a major consideration.

Conference systems to control a conventional trajectory will present many problems but the aerodynamic loadings and heating conditions experienced in the conventional case are often the capability of using passive padding techniques.

Researches of the vehicle below the transonic temperature, choice of lighting, temperature is about 100°F. Thermal insulators, longitudinal and lateral structures are made of T-231 and T-247 aluminum, choice for lightness.

Another interesting conclusion concerning the relative merits of hypersonic vehicles and supersonic aircraft was reached in the NACA. On the basis of equal costs once an aircraft is built at the cost of powered flight time, it seems to be comparable for range over the half the circumference of the earth or greater. Therefore, the hypersonic vehicle is addition to the advantages of great speed has the very important possibility of attaining unassisted flight time.

Vanguard Satellite Materials Detailed

Washington—Variety of unusual engineering advances planned in a series of progress reports shows up in the construction of the Martin Co. Vanguard satellite launching vehicle.

None come up in a mode of statement because it provides a good test bed for temperature at excess of 1,000° F. caused by atmospheric heating. Weight is 163 lb/m. or comprised in 264 lb. each.

Researches at the nose cone is made of stainless steel plate. The ten choices are aluminum, titanium and stainless steel. The last is selected because of its high strength and weight of 500 to 600 lb./cu. ft. Weight is 0.65 lb./cm.²

A magnesium thermal alloy forms the interface from the base of the nose cone to the top of the second stage fairing. Again, the metal was chosen for its lightness and ability to retain enough at expected temperatures—in the case, 1,000°F. Weight is 0.62 lb./cm.²

Second stage fairing is made of 413 stainless steel. Fairing in the Vanguard vehicle, as in its predecessor Viking rockets, is integral—the wall of

the fairing is the shell of the vehicle. Fairing is a vacuum insulated heat-shield with heat loss being varied as an insulator. Choice of stainless steel was based on corrosion resistance, ability to heat-treat and good strength properties. Internal pressures are the determining loads. Temperature is approximately 1,000°F. Weight is 284 lb./cm.²

Thermal insulation and air flow are made from magnesium alloy expected to withstand temperatures up to 1,000°F.

First stage insulation is 415 aluminum alloy, choice because it is available and has great strength for buckling loads. Liquid oxygen tank temperature is approximately minus 350°F. and known tank temperature is approximately 200°F. Weight is 101 lb/m. in.

Resistivity of the vehicle below the transonic temperature, choice of lighting, temperature is about 100°F. Thermal insulators, longitudinal and lateral structures are made of T-231 and T-247 aluminum, choice for lightness.

Another interesting conclusion

Soviet Shows Satellite-a-Month Capability

By Everett Clark

Washington—Soviet early satellite demonstrators a capability to launch at least one a month and conclude Soviet statements that the satellite program requires an unprecedented single project exploitation of scientific and engineering effort.

From Soviet Aquarius II, it was predicted that the dog's first flight would be in October, and Soviet news reports later said Soviet I was launched with an intercontinental ballistic rocket and had disclosed a dual-purpose ballistic rocket that could carry an animal or thermal nuclear warhead; as also "contain in circumstances of living beings in conditions of space travel."

Now is telling us was another of space flight milestones, a world record encompassing four months.

Space to U. S.

"Troops of activity for government, scientific and military leaders have been increased by Spain. Its leadership, Moscow already was working 12 and 14-hour days to train and try to convert Soviet administrative practice, a French 1949 budget was confirmed and exchanged powers, and enhanced Soviet-U.S. cooperation of Defense but a Congress and a public that suddenly had developed vicious sparring for political and military knowledge."

Soviet II, weighing 1,128.29 lb., was put into orbit at an altitude of 1,070 km. at an angle of 65° deg. south of the Equator. It remained a semi-circle of the Loka breed, similar to a Spitz, at an altitude of 1,070 km. and maintained orientation with Earth and communications equipment. It had temperature, humidity, oxygen, blood pressure and temperature sensors.

In addition to the instruments attached to the dog, Spain, II contained instruments for monitoring solar radio-

flux, ultraviolet radiation, X-ray red coronal rays, and pressure and temperature, the Russians said. It also maintained a power source and radio transmission waves 20,000 and 40,000 cps.

Orbital velocity was 17,500 mph, apogee was 923 miles. Semiperiod, the bipolymer orientation in Circinus Minor, extending the equator at 1,070 km. The time in the orbital circle, revolution period, was about 184 min. Speed was straight line, fast, short, about three parts.

Spain II's weight, Russians at one point described the dog's condition as normal, indicating that it might be the passed forward and out of the radar or the forward end plus the third stage Soviet rocket, which was 1,120.29 lb. In April October, Yuri Pobedonostsev and K. M. Kozlov wrote in the Russian world magazine New Times, "The . . . intercontinental rocket produced in the



SOVIET dog after a satellite flight recovery.

possibility that a "super-fine" new rocket Russia have been working with most, if not all, advanced research facilities known to the West, and Shostkovich's article in *TASS* and they also are working on photon rockets.

• Measures of Loka's some that found the dog's food and the dog and man. Let me then Soviet statements have been corroborated. U.S. observers can measure it possible but difficult task a 100 and say the pilot of Spain II will be 40 km. lower than Spain II. I am in fact to put the dog down now. Paul Anatoli A. Blagoveshchenskiy and a Moscow resident a day after the launching part the life of the dog is safe," in *Soviet Aviation*, May 1959. B. M. Melnik wrote that a general of staff had been down on the launching site and the dog was healthy. An East Berlin Government newspaper and Luka's cub was reported from *Sputnik*. II "after a certain time" and landed by people after a three-hour, bailed flight. Sputnik II's world wide coverage of the landing site, the paper said.

Apes Are Next

Anthropoid apes will be the next species to undergo a launching in the official Communist newspaper *Pioner*.

Soviets also have stated confidence similar to those that would be expressed on a flight to Mars, according to Dr. V. V. Rostov, director of the Institute of Space Research.

Professor L. J. Soko wrote in the *Young World* three days after Spain II was launched that "in the present basic projects for long-range flights for a rocket trip to the moon is still as around the sun, the



HARNESSED dog as presented recently.

Defense and the President, to eliminate duplication and assure that all programs are passed to a common porton." He said the launching of Sputnik II "should have stopped any remaining mark of complacency on the part of thoughtful persons" and that the Soviet challenge is "dead serious."

Bridges said the U.S. is "already" up the learning curve in the field of space. This coupled with the fact of enormous basic knowledge would give the U.S. a superior strategic position. But he demanded an "all-out effort to maintain our position." He argued that the congressional investigation "will put the blame for past errors on my particular individual or group. We have no time to lose."

Mohr Visits Schenck

Meanwhile, there were three other Congressional delegations:

- House Appropriations Subcommittee on the Armed Services headed by Rep. George Mahon (D-Tex) prepared for conference of the fiscal 1959 defense budget early next year by opening a closed door investigation of the missile program with a series of meetings with Maj. Gen. Edward A. Schenck, com- mander of the USAF Ballistic Missile Division. Bridges, Lt. Col. Schenck's replacement, Capt. Carl E. Ingoldsby, Capt. Gold, Headquarters, Loring, the submarine control Center and manufacturing facilities at San Diego for the Atlas intercontinental ballistic missile, the Argent Comand legend rocket family, and the Douglas Aircraft Co. Thor IRBM test site at Sacramento. The reconnaissance phase, beginning soon, will include said Ingoldsby, Washington and members of the House Armed Services Committee.

- Staff of House Military Construction Operations Subcommittee headed by Rep. Charl Hulsefeld (D-Minn.) recent visited with a factfinding study of weapons programs of concern with legislation to place all defense under the Department of Defense.

- Sen. Clark M. MacGregor (R-Va.) signed a memorandum of understanding in direct weapon programs a proposal which also has been made by Sen. Kefauver and Mansfield.

- Sen. Byrd (D-W.Va.) declared that despite the breaking of two exhibits, "nothing has been done to streamline the defense program." With recognition of tremendous ballistic missile "news" in the future, Senator postured that "plans and programs for cutting down those areas of overstatement and overdelegation."

- Sen. Johnson and the son of Spanish II and the defense was perplexed from the earth, gave no reason to suspect the Soviets now have achieved nuclear rocket propulsion ahead of us."

In line with the still existing congressional concern, there were three more:

- House Civil Service Subcommittee headed by Rep. James C. Davis (D-Ga.) opened hearings on the post election of aerospace managers in the Defense Department and the pending test of aerospace under defense contract.

Davis charged at the beginning that those removed from the aerospace had been chosen "not on the basis of reduced defense costs. It went out to choose to continue if we are to win the ultimate victory over world communism."

New USAF Funds Ease Cutbacks But Economy Efforts Continue

By Claude Witte

Washington—USAF and its major aircraft industry contractors, assured that money will be available to pay off considerable bills in the next eight months of fiscal 1959, maintained their efforts last week to reassure public and congressional leaders that the \$10 billion available for Air Force procurement in the next four months (SW, May 4, p. 26), it appears that adjustments are being made in two areas:

- Contracts expenditure estimates in general have been revised downward. This does not mean that all companies found it necessary or possible to reduce their estimated billings, but some were forced to adopt more realistic estimates. In this case, this involved the recognition that earlier figures were somewhat inflated.

- Production schedules are being revised in many cases to reflect new contracts. Company representatives and air are being called in at Materiel Command Headquarters in Dayton, Ohio, to consider opportunities that will be acceptable both to the manufacturers and the Air Force.

Minor Adjustments

A USAF spokesman told Aviation Week some adjustments will be made and that there will be no elongations or cutbacks for the single purpose of saving money. "Our only determination," he said, "is to get money out of the schedule if it is available."

It was anticipated that the Dayton session will be followed by the rest of the industry in a program to revise its projections to 75 percent USAF contractors. Air Force Stevens, James E. Douglass, gave the industry credit for understanding the financing of war work-in-progress under existing contracts.

See: Walker F. Bennett (R-Utah), former president of the National Association of Manufacturers and an Aerospace spokesman on economic matters, declared that "the problem of keeping the dollar around is more far in the past than that of market research—and perhaps even more important . . . We cannot permit the current news from Russia to serve as an excuse for fiscal irresponsibility. If we do, we are destined to become the first superpower to go bankrupt, strength of the nation, which, in the long run will give the ultimate victory over world communism."

airplanes, purchased all of which were announced as redundant.

Growth and expansion for all of United Aircraft Corps in 1958 will be at least as great as those for 1957 due partly to the readjustments in Pratt & Whitney schedules.

The P&W engine plant passed of 40,000 will be cut to about 1,000. 800 hours will be required immediately. Elimination planned division will retain the 10,000-hour plant, about 31,500, and Sikorsky Aircraft Division will continue, to carry 10,000 employees.



Medium-Range Circuit Transistors Developed

Dallas-Textron Instruments has developed two new diffused base medium power transistors. Both are the gate-controlled type, particularly suitable for power and high power transmission.

The new transistors will prove design of transistorized medium power circuits striking their low cost at 25°C case temperature and one with at 190°C case temperature, temperature ratings according to Textron Instruments.

Both transistors have a typical collector resistance of 20 ohms at 25°C, plus a typical collector-to-emitter voltage of 150 to 200 volt. They are transistorized at 25°C. Common and drain diffused base resistors are well suited to high temperature switching applications because of high peak currents resulting from case with 190°C dissipation and 10 ohm collector-emitter ratings.

One of the new transistors is a 65-volt unit and can be used with 25-volt power supplies used in various military servos. The other is a 100-volt device for use in high voltage power supplies. The transistors have a self-adjusting drive for temperature rating, an eight volt minimum carrier-to-base rating and a typical case-to-case thermal resistance rate of 30.



Boundary Layer Control Cuts F-104 Staff Weight

Boundary layer control (Lockheed Aircraft Corp.) F-104 aircraft wing planform, as shown in figure 1, is designed by the first of the two teams. Williams P. Givens, Lockheed president, is that the replicas are filled with Pratt & Whitney jet engines and gear of the scheduled 1958 original must be postponed until 1959. Givens and the manufacturer are in close contact in military aircraft production



Soviet's Develop Flashlight C

Flashlight C, Roman (Soviet night fighter interceptors) is believed to have afterburner. This is in addition to the Mach 1 performance. Overall span of the two wings is 40 ft. Overall length 35 ft., gross weight 30,000 lb. Planes mounted on top of right fuselage. Flashlight B, both planes are developments of early Soviet夜戰機 Flashlight A.

KC-135 Aerial Command Post Evaluated at Andrews for SAC

Washington—Prototype of a Boeing KC-135 aerial command post will be evaluated at Andrews AFB for the next three months to evaluate its mission role communications equipment.

The current, a special version of the KC-135 jet tanker now at Andrews, is the first of four aircraft to be modified by the Boeing Co., Wichita, Kansas, under a \$10-million contract. It is capable of certain communications with any point in the world while flying at its regular speed of about 600 mph.

Communications Link

Applications of the KC-135 flight communications system by the Strategic Air Command are available with a choice of a ground-to-air link or a ground-to-ground link which can be directed with full coordination with all ground and airborne elements. SAC now has radio equipment cap-

able of linking headquarters at Offutt AFB, Omaha, Neb., with all major bases and the command itself.

On a typical mission involving the Boeing B-57 or B-52 jet bombers, it would be possible for the commanding officer to keep in touch with the units involved at Andrews, Air Materiel Command, Air Defense Command, Tenth Air Force and even the White House. There is a radio map set controlled primarily with existing radio equipment.

In addition, the radio gear installed in the big Boeing jet is equipment designed by USAF, Calspan Radio and the Electro Corp. Some of the sets will be changed as the experiments continue.

The prototype aircraft has nine air foot probe antennas, one on each wing tip, to determine their position during a maneuver. Antennas between the top of the radome and the vertical stabilizer. The probes can be rotated to measure at any selected frequency. The wave antenna has a good

KC-135 was in close communication with radio stations known as South Africa, Paris, Thalke, Alaska, Bermuda and the U.S. East.

On the flights out of Andrews AFB in the next three months, the equipment will be tested and evaluated for range interference from long and short propagation, type of equipment and test equipment availability. No pattern has been set for the flights, but it is assumed they will range over most of the world.

Prototype Design

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directive characteristics, but are not suited inferior to the probes in directional stability.

Evaluation of single satellite operation for SAC purposes goes out of experiments conducted by Gen. Col. E. Lehman, now USAF vice-chair of staff.

When he headed SAC, Gen. Lehman had SSB equipment in a command aircraft and found it was too tall that he could communicate with 55 different countries and get the benefit of the power savings.

The equipment is more expensive than the ordinary radio receivers and transmitters, so in transport and maintenance, it is usually heavier. However, it provides a system of operation longer range, more reliable, faster, and long-range reliability. An other major advantage is that several conversations can be carried on over the same frequency, because there is no existing carrier signal. This is a major advantage in work on the same frequency as long as they do not talk at the same time.

Soviet Engine Output

Gen. Lewis noted that Russia is eliciting a strong response and requires with an annual output base the U.S. rate and that has to be to the USSR but our solicited that these students are being trained with more recent types of equipment and by through well-qualified field instructors.

Students that back their own part of knowledge with a vigorous information gathering agency that collects published material and report back to our own field instructors, these men and students enable them quickly to the proper orientation and research courses, he said.

To meet these challenges, Gen. Lewis quoted warning that management must do its part in reducing overhead costs, as well as direct labor costs and overtime pay expense. He and management must also realize unprofitable business is the most efficient re-examination of corporate controls and cost reduction measures can be made available to management.

Gen. Lewis also is reducing the use of progress payments prior to delivery of the first article. Gen. Lewis told the Fitter group, "We can accomplish this in a much more effective manner," he said.

When Gen. Lewis had to cancel his date with the Texas team, he quickly made it to Rockford, Ill., to speak with USAF, etc., assistant to Texas Project Director Robert McCallum.

Criticism of USAF

Reviewing recent steps taken by the Air Force to reduce costs, Gen. Lewis observed that the first move was to cancel such projects as North American's X-15 hypersonic aircraft, the Convair B-52D and to cancel and such programs as Boeing's supersonic transport, the Convair strategic intercontinental missile and the Convair X-15 aircraft.

These decisions were natural results of USMS and, Gen. Lewis observed that the fact of this criticism was, "We didn't know what we were doing and that we were taking some wrong decisions."

"I think we have been, and we did know what we were doing," he said. "On the basis of giving top priority to those aircraft which could provide the most at the greatest operational advantages and, gradually, priorities throughout our entire procurement program, we stretched or stretched out at the lower end of the scale."

If we made mistakes, they were in the details of taking actions not in the actions themselves," he said.

The USAF material chief and the prime effect of the expansion can still be a more robust approach to measuring methods and cost estimates.

BEP and procurement will be unacceptable as a base for progress, he said.

Joining the Air Force's efforts to operate on a per acre charge, Gen. Lewis and USAF will have to put more radio facilities according to its evaluation of company activities to avoid exceeding "cash-on-hand" operating funds.

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Engines should also get away from "set-in-motion" type engines, he said, and make use of automation and digital control, he said.

Gen. Lewis said engine manufacturers provide more pounds of thrusting per man-hour at the production level. He said it is becoming more important to use up-to-date production methods and equipment, that more automation is essential, although he warned that automation should be used to increase and yet per hour and not to reduce payloads.

British Air Rescue Group Plans Arctic Rehearsal

London—British Air Rescue Group plans to practice eight days over the North Pole in May, to integrate the teams that will conduct rescue missions after a plane crash or forced landing. Sponsor of the project is the Council of Management of the Polar Air-Sea Rescue Expedition of 1955.



Shrouded Atlas ICBM Is Transported to Florida Test Center

Mentioned for security, an Atlas intercontinental ballistic missile is transported from San Diego plant of Convair Division of General Dynamics Corp. to the Air Force Manned Test Center, Cape Canaveral, Fla. Atta is 40 ft long, 15 ft. in diameter (AVN Sept. 2, p. 20).

Newspapers Discuss Secrecy Issue

(Continued from page 21)

leading to a gene impasse when Spadolini was unseated Mr. Carter got in a classic instance of bantam leather left work and journeyed on his vacation in Italy. It is reported that he had been given a "secret" clearance to do so. He also is said to have informed relatives overseas that the measure, though withdrawable by amendment, was not made feasible but desirable. There are strong疑點 that Carter was rather shamed at a realized that the so-called breach of security of which Mr. Carter took refuge is not of clear importance to the American people. That has been shown to the point of acrimony, since Spadolini, no longer in office, after all, so logically off the sensitive field.

Mr. Carter has a reputation for keeping his nose out and listening that exceeds the local police. Furthermore, United States Representatives, Mr. McCall and Mr. Hinsdale, are quoted as saying that Mr. Carter did not know if or he intended to give a two-government. It can't. Mr. Carter ought to remember these words of Thomas Jefferson, written long years ago when another government agreed with him before withdrawing some information. You fellow citizens think they have a right to feel information, as a case of such good construction to them. It is then most which is to turn off the expenses of the war, and their blood which is to flow iniquitous of the cause of it."

The Passion for Secrecy . . .

Louisville Courier-Journal

In the last two years the House Information Subcommittee has done good work in trying for public's right to know how its business is being run. It has exposed shadow instances of the treachery of federal agencies to appear informants—and exposure has forced some helpful changes.

But now the committee, under Chairman John J. Moss of California has, even after insistence to expand. This is the latest general effort to expose the secretiveness of the secretaries—secret documents of particularity during its public administration as government policies to keep secret.

The first that the question arises of all is who is itself to be the government's position for closed-door meetings at which public business is discussed. Robert Carter, White House former editor in the National Security Council, addressed such a meeting of lawmakers of the Commerce Department's Foreign Affairs Committee. The press was invited, but invited to be seated in the rear, which is where the secretaries sat. In the front row there stood Mr. Carter, representing the advertising branch of Aviation Week, the trade publication which on October 21 recorded that the U.S. has been tracking Russian warplanes on special radar equipment in Turkey. Carter described the story as one of the most secret batches of military secrets in years, a "classified disclosure." And so on.

The White House has worded disclosure of the bantaming guitars and quoted Mr. Carter as being "classified" instead of "inadmissible." But Chairman Moss very properly wants to get a full report of the goings-on at Hat Springs by questioning Mr. Carter.

With the information, the Subcommittee may discover that there is a place. The government has no business collecting off the record attack before an audience of lawmakers for the avian public pronouncements of Aviation Week which a White House spokesman says is possible.

Another result of the Hat Springs session is the large suspicion that Aviation Week's real "classified" is because of the fact that the government for more than two years has been suppressing knowledge of Soviet missile attacks across two years in which such suppression led the American pub-

lic to accept with completeety accepted estimate in our program.

An Atlanta Robert Holt announced when he published the paper, one radio station reporter was a series from no one, except the talk of the American people. The Russians, the Turks, and just about everybody else knew about it, but was substantially confused by other Washington reporters and suggested by the logic of circumstances.

If the government wishes to dispose these statements and to postpone Aviation Week's fit as what kinds of security negotiations let it make its case in the courts. In the meantime, as we have, that the mere launching of Chairman Mao's pride will disengage every Washington's own temperament, as he has described it, and put a new meaning to "newsworthy"—especially on everything that might ever happen.

And if more publications are to be interested, let's hope it is to public authorities and legal practitioners, not in street demonstrations before defense-industry leaders, who might not even want to hear the word "beyond" before deciding that doing business with the publication demanded would be your correspondence ended.

Leaks vs. Light

Los Angeles Examiner

How far should the government go in withholding information from the American people in the interests of security? This question has been raised anew in Land Wright, a past president of the American Bar Association who headed the Committee on Government Secrecy.

Wright has urged enactment of legislation which would provide, with fines and/or prison terms, newsmen and others who disseminate government "secrets."

He told the American Society for Industrial Security, meeting in Washington, that he had been among such legislators who believe "we are one of the first orders of human welfare to consider this issue."

The real point of this issue is, of course, who shall administer it?

Bureaucrats are all too prone to "classify" information which the public has a right to know.

Sometimes it's merely a case of party officials playing safe. But the source label also can be used to cover up serious mistakes or errors.

These have been a few exceptions, but by and large the American press has been admirably resolute in dealing with the government when such unnecessary secrecy is insisted. The question which would remain remains for revealing information which was kept secret by federal administrative "secrecy" is a dangerous entrepreneurial game the people's right to know.

To shut off classified news leads is the manner all too often results in shutting out the light by which the American people can see what their experts in the federal government are up to and how they are spending their money.

This is not the way to achieve greater security, which is essential to the safety of the nation, but it is the way to an avoided relationship which is inherent to the natural goals of freedom.

... Revealing Secrets . . .

Dallas Morning News

A dispatch from Washington says that a bill will be introduced in Congress providing facts and confirmation for

newspapers and others who reveal government "secrets." Land Wright is a certain member of the Committee on Government Secrecy which has been pushing this legislation. Aviation Week has published a short article calling for the United States to issue some kind of bid order equivalent to T-44s attacking would bring by name. "I suggest that someone would not think less highly of the possibilities of invading fit extent before publishing that type of thing," Wright said.

But what about Aviation Week, get the star? Somebody in charge of fit T-44s would not think less highly of the possibilities of invading somebody else who had tipped off somebody else who thought of the invasion.

AVATION WEEK cannot have compromised all over the world. No newspaper or government is in a position to know, the government should be the most reliable, and the invading a close office to stand in one by one knock

of the bantam trying to show its superiority over the other. But all forms of media, to avoid strong regulations should current generate a new standard of press and speech, and the rest of the country's voice. Demands of that security a distribution of all its forces.

In writing voluntary censorship worked well. Protection was high, of course, at almost zero in the face of pent

The danger of a low level and suspicious reporters who need "secrecy" in the government's inability to define secret. The 1,500-fold banter and commentaries in the federal government constantly will engage the area of reflected information, until research we the secret public will be considered a secret. We will have government by blunder. The first step toward success is to let the documents to protect their own. The next step is for all media to receive one and another, consciousness that all freedoms are much with serious information.

News Digest

English Electric P-16 interceptor has been flight tested successfully for the first time with de Havilland Firestick aerial missiles with which it will be equipped. The test, which took place at Farnborough, will be followed by trials with the long-range Firestick missile which is expected to reach speeds of Mach 2.5 in flight at speeds of Mach 1.5.

Lockheed's Modular Systems Division, Folsom Airfield, Calif., is using a 10-ft shock tube to test advanced designs of the Navy's Future Vehicle missile. Test programs are presently generated with the use of the shock tube that a long-range ballistic missile would accomplish in flight at speeds of 1,100 mph.

New order for Naval Cag CT-20 target missile has been placed by British-Singapore Ministry, produced by Farnborough Marconi Aerotech, will be over by April 1967.

Hughes' Paris, aviation partner and lead in the joint venture that will have been his name, has signed a contract upgrading aircraft in Air France, holder of the Melpar jet fighter. Air France shares formerly were greatly owned by French aviation companies.

French have had trouble loss under belly of debt since Gerhard experimental interceptor at supersonic speeds are likely to be first of three kind to be completed at Europe. Experiments are being made at Dornier.

Japanese Government approval of a turboprop fit up with Constellation AG of Switzerland has been requested by Mitsubishi Electric Manufacturing Co. The agreement valid for 15 yr, would cover the design, manufacture of Constellation ground joint ground assembly and long control stations for intercontinental flights.



Flatcar in Atar P3 Test Rig

Latest version of Saurier's Flying Atar, the model P3, is aged on a mobile trailer for tests to determine effects of relative wind flow on the jet exhaust of the VTOF vehicle. Atar will be secured horizontally behind high pressure turbines. Jet exhaust directed at densities of four different wind speeds conditions of vertical descent. French State Railways are competing in tests, which will either straight track of track in Madras area, one fast. Credit management, needed a plot and covered trailer for discernible P3 will be in free tests only in vertical flight, but P3 as maximum will begin conversion. Vehicle runs basically on Atar 10 turbojet (AW Aug. 5 p. 30).

AIR TRANSPORT

Airline Earnings Point Toward New Low

Industry profits show sharp dip in third quarter; earnings for 1957 may fall below \$50 million.

R. L. L. Doty

Washington—Airline earnings for 1957 appear headed for the lowest level in three years. Profits continued to dip sharply during the third quarter of the year, and it is expected that the trend will continue.

An Airway News survey of domestic airline activity during the 12 months ending Sept. 30 indicates net profits for 1957 will fall below the \$53 million mark for the first time since 1953. Estimated profits for the 32 weeks at \$46 million, compared to an actual net total of \$59 million for the same period of 1956.

Performance, although improved significantly from the 1956 decline, is still far below the healthy development pattern of the industry, passenger traffic during October fell short of forecasts. Should the downward trend in passenger traffic continue through the winter months, an even deeper depression in earnings can be expected.

Highest earning month for the industry was established in 1956 when the domestic airline industry reported a net profit of \$63 million compared to \$51 million in 1954 and \$57 million in 1955.

Passenger Increase

On the strength of the present carry, 10 to 15 percent increase in passenger traffic can be forecast for the year. Although this estimate compares favorably with a 5 to 7 percent gain in 1956, it nevertheless shows the two years is substantially below the 1956 gain experienced during the past five years at the 20% annual average during the 1948-51 period.

Operating expense showed signs of softening during the 12 months just ended, indicating the airlines are getting well below the profit peaks which had plagued the industry since the fall of 1956. The Air Transport Association of America World Airlines report an average of the management cost of 1.75% is assumed as normal in the climb of costs per available seat miles during the last nine months of the year.

Estimated operating increases for the domestic airlines during the 12 months reviewed amounted to \$1.5 billion as compared with an actual \$1.1 billion in

and for 1956. Net income climbed by \$2.4 million compared with earnings of \$46,000 through the third quarter last year.

Net income before taxes for 1957 was \$1.6 million of which \$1.0 million was from transport operations and \$1.9 million from the sale of assets. The airline's international division produced a \$2.6 million profit before taxes on revenues of \$61 million, compared to a \$1.6 million profit generated in domestic operations from gross revenues of \$45 million.

TWA's net per available seat miles were steep from 23.4 cents in 1956 to 26.3 cents in 1957 as domestic revenue rose from 48.3 cents in 1956 to 44.5 cents in 1957, an international revenue

Retarded Traffic Growth

Globe Airlines, TWA, president emphasized the future of the industry depends on continued expansion and will stimulate traffic growth was reflected in September results when earnings fell 10.5% from \$1.9 million to \$1.7 million in 1957.

During the first eight months of the year, available seat miles rose 16.7% as compared with a 12.6% increase in 1956. Decline of 1.5% was experienced during the next two months may bring the estimate to as high as 25% in 1958 unless return to a high rate of new equipment is accelerated to a level rate than has been experienced to date.

Captain Airlines also reported that traffic held with operating expenses pulling above operating revenues during the year. Total revenues were up 10.6%, operating revenue increased \$10 million as compared with operating expenses of \$4 million for the first three quarters. The rate of revenue climbed to 56.9 million and expenses reached \$66.6 million.

The carrier finished its three quarter operating loss of \$1.5 million in 1956 due to operating revenue of \$4 million less than \$5.5 million. Net loss was \$2.4 million or 10% to 12 million for the first three quarters of 1957.

Kayair Air Lines reported a sharp decline in profits for the first nine months of 1957 although operating revenues for all four half of the year. Average increased 27% during the period causing a 35% decline in net profit.

Laid Airlines dropped from \$6.705 in 1956 to \$5.5 million in 1957. This figure pointed out in my third quarterly report that wages were up 18% over the first six months of 1956. Total wage increased 15%. Total net earnings for the carrier was \$4.9 million for the nine month period, compared to \$1.1 million in 1956.

United Air Lines' latest 12-month record goes during the first three quarters of 1957 by more than

\$14 million, but net earnings dropped from \$40.1 million last year to \$3.7 million this year. Operating revenue declined from \$300 million during the corresponding period of 1956 to \$214 million for the same period this year. En passant note from \$17.6 million to \$2.9 million.

United's third quarter revenue just under \$100 million declined 12%, but net idle seats jumped 15% during the same period.

During the first nine months of the year, United added 27 new four-engine planes to its fleet.

Delta Air Lines reported a passenger traffic increase of 18.3% during the September quarter-fourth of the carrier's current fiscal year which ends June 30, 1958.

The airline, however, recorded a 26.6% decrease in operating earnings for the first month period. Net income for the period was \$15.6 million, up from revenues of \$18.4 million in 1956 income up 10% to 12% in 1957.

Reduced Earnings

America Airlines reported a big decline in earnings from \$17 million during the last three months of 1956 to \$10 million for the same period in 1957.

Net earnings per share of common that include a gain on disposal of property declined from \$1.75 in 1956 to \$1.25 during the two periods.

Total revenues increased from \$21 million in 1956 to \$31 million this year.

Earnings declined from \$2.81 million to \$2.3 million during the same period. American's net loss of \$7.1 million was \$3.9 million, or 6.7% increase over the 1.6 billion revenue per passenger for the same period last year.

The airline moved 4.6 million tons miles of freight during the first nine months of the year, an increase of approximately 24.8% over the same period last year.

Financial Setback

Northeast Airlines suffered a marked setback for the last nine months as the result of a jump in gross expenses from \$7.6 million in the 1956 tone sum period to \$13.3 million for 1957.

Net loss for the first nine months of the year reached \$2.568,461 compared to a \$6.568,735 loss during the same period last year.

Revenues were up to \$31 million from the 1956 figure of \$17.8 million, but the airline began to feel a traffic slump in September. The September load factor slipped to 42.51% from 51.19% in August and from 51.71% in September, 1956.

Fare Probe Begins Next Week; Domestic Lines Renew Efforts

By Fred Radman

Washington—Domestic truck industry officials started their efforts on Monday to have hearings set in the General Post Investigation to prove that the carriers need a fare increase despite a favorable past earnings record.

Airlines say a fare boost is necessary because costs are increasing faster than revenues, lowering profits and reducing chances of obtaining the financial backing necessary to move into the jet age. Rate increases asked by various carriers range from 5% to 25%.

Difficult Task

The task is not expected to be an easy one. Gov. Adlai Stevenson Board turned down requests for a 6% fare increase in September on the grounds that evidence presented did not support the carriers' contention that the increase was necessary to provide an adequate return.

The Board and its decision was based upon the fact that the carriers' fares were only 6% above costs when they filed their original rates in 1956, according to the carriers' own figures.

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Better Years

The peak between 1950 and 1956 is generally reckoned the best six years for the airline to appear in historical statistics.

Although the Board took notice of declining profits last year and this year, it nevertheless set on the basis of the second the present depression management proposed due to short term factors. It said an evidence had been submitted to show that fares could not cope with the downward trend in profits.

Throughout the opinion that accompanied the decision, GMB repeatedly pointed out what a terrible record the industry had made in the last few years. It would take considerable time to determine the cause of a sharp recent loss was an ultimate or not. Among these were:

• Evidence shows that the carriers have had substantial earnings in the past, and they have not established that the economic and operational factors

which in the past afforded opportunity for reasonable earnings, under economic and efficiency circumstances will be repeated in the future.

• There is evidence that such a low-to-moderate rate of return—say, moderate in the past, and no carrier has introduced evidence into the record supporting a different rate of return. The position of the carriers is that they are satisfied taking a dollar amount of earnings for the Board's consideration as is reasonable, without advertising any particular rate of return.

• Most significant advanced in this proceeding is support of the carriers' contention that carriers are no longer to be subsidized by the public, not only than their revenues exceed costs only when they are dominant. However, no carrier other than United has offered evidence to direct to support this proposition.

• Most of the carriers contend that the best of this year is the beginning of that change as legal at a reasonable level so as to maintain an incentive for further expansion and to provide a fair return on investment.

The carriers' case after all, is that such a rate could stimulate the market and provide a better environment for the industry. The difficulty with this claim is that it lacks adequate support. There is no evidence to support this claim on the part of the trucking industry, generally, to obtain necessary financing for replacement or expansion needs. No justification was offered from members of the financial

Capital Wants Subsidy

Washington—Captain Airlines filed the Civil Aviation Board last week for a return of subsidy payments to its equity investors in estimated 1955 net loss of \$15 million. The airline was last granted three subsidy payments in October 1956.

In a petition filed with the Board, Captain said for subsidy aid payments of \$7.67 cents per revenue mile provided in addition to the net income of the airline to cover its costs. The carrier said it was faced with an uncertain future because of a recent merger and doubted its ability to operate without subsidy, because of a recent lowered condition.

Captain told the Board it would need an estimated \$2.5 million net loss in 1956 or revenue of \$37.5 million to cover the loss of the year. It added that a \$15 million subsidy would be the minimum needed to keep the airline in operation, which the airline described as a "very remote possibility." Captain would sustain a \$5 million net profit on \$118 million gross revenues.

community as to the level of earnings the carriers would require in order to obtain additional financing.

Bailey's Stand

Bailey Mowbray Lowe J. Hester, who filed a separate memorandum, summed it up this way:

"One aspect of the case seems to me of particular significance. The current case for an emergency moratorium is based in large part on the claim that passenger carrier fares do not produce sufficient earnings to enable the carriers to meet their obligations. I think that argument is wrong."

Yet the record, to my mind, contains little real evidence on this subject. In general, the carriers' costs rest on the unapproved increases of their own executives that an administrator has or cause to exercise. For them to complete their required financial arrangements.

From the response, the Board left little doubt what criteria must be met in the use of evidence to justify a fare in excess. Hester was silent on some specific grounds. He said that if first increased in parallel in order to finance these compensation programs, the Board would require convincing proof that these programs are reasonable and economic.

Britannia Crashes

British, England-Baileys Aeroplane Co.'s prototype Britannia 300 crashed on a test flight killing all four crew members.

The aircraft and the crash were reported in every major newspaper shortly before the crash. It plunged to the ground at the landing pattern at the company's Ellesmere Port base while having its first approach.

First, eyewitness reports and the Britannia "blake up" in the last few newspaper headlines said there was nothing unusual about the flight except that the aircraft had been flying at a relatively slow speed, while taking a final approach. May day?"

* Points reported by airlines also will be affected by fuel cost and by depreciation, depending upon the rate allowed for the aircraft and the annual value. The CAR states in the annual report that the aircraft will reflect a lower profit than the annual report.

* Carriers also contend that, in se-

cely and financially feasible.

It seems to me, that a continuing generation of the carriers' equipment and their related funding needs could reasonably resemble like the following:

- Long-haul traffic projections, including traffic stimulated by fuel savings from the introduction of jet aircraft;
- Aircraft purchase and disposal patterns related to introduction of jets;
- Planning plane warranty to some plus the position of security;
- Rate of return or level of earnings required to meet the cost of capital.

* Passengers have levels reasonably to achieve the seasonal city of service.

* Evidence that the proposed increases are compatible with the traffic projections with which the planning began?

From exhibits already referenced in the General Passage Fare Investigation, it appears that the carriers, following the others, fully exhibit certain considerable written testimony from financial experts regarding airline financing.

Other Issues

Other issues or questions that will appear during the investigation include:

- Accounting procedures. An expected rather expensive in line with the cost used by the CAB in the past during rate proceedings to determine justifiable expense? Is the past inflation of dollars of regional airlines that have been classified by the CAB as non-comparable and comparable an efficient management technique of all expenses, whether published or not, would tend to depress profits reported by carriers?
- Profits reported by airlines also will be affected by fuel cost and by depreciation, depending upon the rate allowed for the aircraft and the annual value. The CAB states in the annual report that the aircraft will reflect a lower profit than the annual report.
- Carriers also contend that, in se-

vicing the adequacy of their earnings, capital gains should not be taken into account until they are subsequent, nor necessary nor necessary to the service, nor, because they may be ploughed back into new equipment. The Board ruled that equipment held on invent or the 10% cap, but that it might have a tax consequence.

- Airlines have concluded that equity investment should be a part of the investment mix. Board Counsel thus stated this as the 6% case. By including equipment deposits in the investment mix, the rate of return would be decreased unless offset by an increase in profits.
- Carriers would like to figure just costs as the basis of available subsidies instead of recompenses. This would reflect in the showing of higher costs and discounted earnings in rate cases.

* Airlines contend the current drop in load factor is due to increased competition from road and air freight and air mail engines. CAB often sees no correlation between the CAB's rate decisions and the actual rate setting of the other four carriers. They believe refresher equipment that is non-comparable to certain market. Considering the relatively high ratio of selling and breeding traffic, the Board and the length of haul is a major cost factor in a rate case's earnings potential.

Another question that may be asked of airlines, and one which the carriers would probably like to answer, is how much fuel has been flying. Airlines want fair level will be necessary to prevent an adequate return on a long time basis?

Chicago-Miami Route Proposed For National in Great Lakes Case

Washington—National Airlines has recommended a two-car fleet for the Chicago-Chicago-Miami route. And Air Midwest, its Northwest Airlines and Southwesternease have been asked to make similar recommendations.

It has initial discussions in the long run involved Great Lakes-Southeast Service Case, Case selected National over six and other applicants, including Capital, Capitol Airways, Northwest, Trans American, Trans World and United

The case seemed a number of applicants for services on a broad axis between the Great Lakes and Southeastern sections of the country, bounded by Chicago, Detroit and Buffalo on the north; Indianapolis, Louisville and Atlanta on the west; Washington and Baltimore on the east, and Tampa and Miami on the south.

There were 10 applicants in the case, five earlier withdrawn. Six were awarded and 15 applications by interested parties outside the bounded area. The

viewing the adequacy of their earnings, capital gains should not be taken into account until they are subsequent, nor necessary nor necessary to the service, nor, because they may be ploughed back into new equipment. The Board ruled that equipment held on invent or the 10% cap, but that it might have a tax consequence.

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Rockodyne's First Flight

London—Parts producer Fairey Rotodyne, designed as a VTOL transport, made its first flight last week at White Waltham Aerodrome. Flight lasted 20 mins and was carried out only. Rockodyne has funded and built.

Russia Unveils Huge Tu-114 Turboprop

New Soviet aircraft, the Tu-114 Beriev, is powered by four turboprop engines similar in appearance to the four Pratt & Whitney engines on the Boeing 747. It is equipped with a electronic, telephone system and Soviet control. Moscow-New York nonstop performance with 370-400 passengers of 300 miles cruise is claimed for the aircraft, designed by group headed by A. N. Tagirov.

airlines contained 375 pages of addenda to eight pages of basic. Checks communicated are:

- Certification of National Airlines to operate between Chicago and Miami via Indianapolis, Louisville, Knoxville, Atlanta, Tallahassee, and Tampa (St. Petersburg) Charlotte, with a restriction that Atlanta be served only on flights operated between the terminals Chicago and Miami.
- Extension of Eastern Air Lines from Charlotte to Detroit via Detroit, Indianapolis and Toledo, and the markets of Akron, Columbus, Cleveland, and Cincinnati, with a restriction prohibiting flights between Akron and Indianapolis, and禁止飞行 between Cincinnati and Indianapolis.
- Extension of Delta Air Lines from Cincinnati to Detroit via Detroit, Indianapolis and Toledo, and the markets of Akron, Columbus, Cleveland, and Cincinnati, with a restriction prohibiting flights between Akron and Indianapolis.

• Extension of Capital Airlines from Pittsburgh to Buffalo via Youngstown, Akron, Canton, Cleveland, and Erie and from Akron to Miami via Indianapolis, Indianapolis and Toledo, with a restriction prohibiting operations between Erie and Cleveland except on flights also serving Atlanta or Miami.

and with a further restriction prohibiting nonstop service between Atlanta and Miami.

- Extension of Eastern Air Lines from Charlotte to Milwaukee via Milwaukee, with a restriction prohibiting nonstop services between Chicago and Milwaukee, and禁止飞行 between Milwaukee and St. Paul.
- Extension of Pan American World Airways certificate to include a regional service between Chicago and Washington, D.C.,禁止飞行 between Chicago and Washington, D.C., and禁止飞行 between Atlanta and Miami, with a restriction prohibiting nonstop services between Atlanta and Miami.

• Extension of United Air Lines certificate to include a regional service between Chicago and Washington, D.C.,禁止飞行 between Chicago and Washington, D.C., and禁止飞行 between Atlanta and Miami, with a restriction prohibiting nonstop services between Atlanta and Miami.

While "negotiations are now under way," a State Department official said the Ratner proposal for an air agreement with the U.S. was included as part of a document prepared covering costs and means of expanding the exchange of ideas between the two countries (AW Nov. 4, p. 41). The U.S. had, however, the program includes some 50 agenda items and added, the Russians have not yet touched on the bilateral proposal nor have they heard that we wish to discuss it. Discussion on the air line agreement was started for Monday.

The four sides of the group explained just the proposed plan did not cover commercial air routes to elaborate on the details of the plan.

Meanwhile, Pan American World Airways, which holds operating rights to Miami and which was not authorized by the State Department to negotiate with the Russians on an air agreement (AW Aug. 27, 1966, p. 25), had informed an official of mainland word is late last week from either the Soviet Union or the U.S. that bilateral discussions are imminent.

New Comet Planned

Hestfield, England—De Hestfield Air least, England—De Hestfield Air least, England—De Hestfield Air least, to plan another version of the Comet 4 jet transport, to be known as the Comet 4C. Designed for operation with extended range, the aircraft is reported to provide about the payload of the Comet 4B with maximum stage length increased by 30% as Comet 4B has been dropped.

THE RECORD-BREAKING VICKOUNT



BEA reports...

VICKOUNT FLEET MAKES PROFIT OF OVER 3 MILLION DOLLARS IN ONE YEAR!

During the 1955-56 fiscal year British European Airways' fleet of jet-prop Vickers Viscounts operated at a clear profit of \$3,150,000—or \$50 profit per flying hour for each Viscount.

And during this same period, BEA's competitive position was greatly improved. On the Great Britain-Europe services—mostly Viscount—BEA's share of market rose to 85% while the number of passengers carried increased 18.5%. BEA comments, "The Viscount has earned these profits from the first day it began flying." The Viscount has shown unceasingly superior to that of any previous new BEA service an introduction so full and safe.

Similar results are reported from all of the 17 other airlines throughout the world which are now flying Viscounts. More evidence that "whatever the Viscount flies, traffic follows."

JET-PROP VICKERS
VICKOUNT
POWERED BY FOUR ROLLS-ROYCE DART ENGINES

U.S. Representative: Christopher Clarkes,
30 Rockefeller Plaza, New York 20, N.Y.

SHORTLINES

► **Eastern Air Freight Corp.** reported a record net income for the third quarter of 1957—\$111,001, equal to 16 cents per ton-mile. Total quarterly revenues rose from \$2,145,628 in 1956 to \$2,981,136 in the third quarter this year. Net income for the nine months ending Sept. 30 was \$54,827.

► **Titan World Airlines** circled a new route around Asia-New York to London Germany. A TWA Lockheed 1049 Constitution made the trip in 10 hr. 15 min., cutting 15 min. from the record set by a Lockheed Super C Constellation last Jan. 13.

► Harvard University School of public health at Boston is conducting a post graduate study in aviation health and safety. Study was made possible by a \$750,000 grant from the Board of Finance, Canadian Foundation, in New York. Doctoral 11 persons are enrolled in the course, including visitors and visiting physicians and engineers from several nations.

► **Scandinavian Airlines Systems** is adding two new paved Jones Bases on its Douglas DC-3C Revel flights from New York on North Atlantic flights and Los Angeles on trans-polar flights. The new services include night flights between Stockholm and Oslo and between Copenhagen and Reykjavik. Starting March 1, 1958, flights will be available to men for the training school, two flights will be presented to all passengers.

► **Pennsylvania Airlines**, Allentown, reported 1957 traffic figures were 80% above 1956 operations. The total airline began its 1957 season on May 27 and completed it on Sept. 24. It flew 5,615 passengers on 3,115 flights over 26 routes. During the summer, 100 night flights were canceled due to bad weather. PAA also reported 1,257 h of cargo from Pennsylvania to Boston. 632 h was carried southbound.

► **British Overseas Airways Corp.** has become world wide agent for Hong Kong Airlines (BOAC) will handle all reservations for the airline.

► **Quaker Empire Airways Ltd.** has flown the first nonstop flight from Harbin, T. H., to Shihlin using a Lockheed Super C Constitution equipped with special wing fuel tanks. The Constitution had a 1,475 mile flight in 22 hr. 28 min. Average speed was 710 mph.

AIRLINE OBSERVER

► Work for increased emphasis on airfreight handling and telephone wire techniques in competitive battle for obtaining winter traffic reaches a peak. United Airlines competitive committee has proposed methods to encourage the carriers to work together to develop better methods of handling wire between less signals, improved telephones and less clutter selling rates. Chief passenger complaint now is having difficulty to wait on a hold key or dead telephone until a reservation is free to handle the request. Problem has been compounded by high volume of calls from passengers seeking to cancel reservations in accordance with the no-show penalty requirement.

► Airlines do not appear to be at a loss for words in explaining the reason why they believe they should be written in or into laws. Exhibits and written testimony exchanged in the General Passenger Fare Investigation do already make such statements as follows:

► Few if any violent labor disputes are associated with air travel according to a scientific research series conducted by the Marketing Laboratories of Tech University. Employing a new technique of word and visual research the Tech group found that no trend is associated with a variety of factors like aircraft, cabin crew, management, and speed. On the other hand cost level is associated with such feelings as prosperity, democracy, plenitude, generosity and high foodstuffs. Persons when asked for the cost of air travel listed less than 200 as far inferior as far and within the price range.

► **Flight Engineers International Assn.**, AFL-CIO, is splitting an inde- pendent airline's attempt to write separate regulations for United Air Lines. The new association, United Flight Engineers' Member Assn., has filed a complaint with the National Mediation Board to conduct a mail election in its first move to pull membership away from FEA and AFL-CIO affiliate, National AEA. FEA now represents 645 flight engineers or about 90% of all U.S. engineer union members.

► **Independent Airlines Assn.** has filed the U.S. Circuit Court of Appeals in an attempt to overturn a ruling against the airline made in District Court July 27. The supplemental airline group claims that a minimum \$116,110 increase in the airline was incurred by its carriers during the past three months as a result of the strike. The injunction was stayed, pending appeal to the court. It had been granted as a result of a \$14 million anti-trust damage computation—later raised to \$16 million—brought by Aircraft Ancillary Transport Assn. and 30 of its members.

► **North Central Airlines** shareholders have approved a stock split plan that will increase authorized common stock from 750,000 to 3,750,000 shares. Under the plan, each share of the airline's present stock will be exchangeable for five shares of the newly authorized stock.

► **American Airlines** is planning a seat reconfiguration on its Boeing 707 jet transports of 180 seats for coach flights, 100 in first-class flights. First-class configuration may include aisle-shuttle seating arrangement in every other row alternated with rows of five abreast seating.

► **British Overseas Airways Corp.** has become world wide agent for Hong Kong Airlines (BOAC) will handle all reservations for the airline.

► **Titan World Airlines** will hire at least 40 British girls for hostess training for winter. A selected board of 100 TWA personnel experts were in London last week interviewing applicants.

► **Northwest Airlines** has petitioned the Civil Aeronautics Board to increase its percentage offering Pan American World Airways proposal to acquire 120,000 shares of Philippine Air Lines stock.



A black and white photograph of a man and a woman. The woman is on the left, wearing a dark dress and a necklace, looking towards the camera. The man is on the right, wearing glasses and a dark suit, also looking towards the camera. They appear to be in a formal setting.

Watson and Richard Tingueau, author teams—“Tinguay the ‘50 isn’t like flying through on any more. It’s as if you were moving through something really solid like stone—or as a submarine, the main hulling your body and yourself. We’re off course half way to a truck, but you’re in. You’ll never have to leave it again.” He performed

William Ryan, *The Boston Globe*: "Tying walls to ceiling" is a common term of remodeling from home to home. In an affordably above roof through the dormer or a doorway of either floor the Soave light a single house, no room would be incomplete sense of spaciousness is guaranteed all three loggia where she could.



Barrie Lewis, Chicago Daily News
"Taking off in a clanging 727 on a dead
stop. No room to maneuver, which
will not promote change. The profit
motive is dead but a driveline. You
can't sing like an angel, just shout in
complete spasms. This is terribly consti-
tuted, a disease as insatiable as the
cancer in most of the bodies." **2002**

The reports above are a preview of what you'll experience when you fly in the superb Boeing 707 jetliner. They are by five of the writers who earlier this year flew coast to coast—in 3 hours, 48 minutes—in America's first jetliner.



The solution already described with NH_4^+ was used to wash the column.

BOEING 787

Airline Income & Expenses—August 1957

G. R. Hall and

	Passenger Revenue	Mail Revenue	Freight Revenue	Postage Revenue	Total Operating Revenue	Total Operating Expenses	Total Operating Income (Before Taxes)
DOMESTIC TRAVEL							
American	\$20,540,700	4,654,300	460,500	\$1,501,334	\$26,696,334	\$9,200,334	\$16,496,440
Braniff	6,410,720	500,200	45,704	126,793	6,999,693	4,221,305	2,778,395
Capital	8,341,487	917,264	91,901	147,749	9,296,037	5,492,679	3,803,358
Central	2,121,177	200,000	20,000	51,764	2,371,764	1,371,764	1,000,000
Delta	8,091,157	1,036,000	70,163	101,701	8,434,868	4,436,456	3,998,411
Eastern	10,739,420	372,250	441,207	1,021,763	11,142,433	5,581,976	5,560,457
Frontier ¹	2,720,000	81,1400	15,406	126,034	3,043,534	4,145,280	763,344
Gulfstream ²							
Hawaiian ³	6,140,449	104,347	75,405	1,000,000	7,891,794	4,049,349	3,852,445
Texas Air ⁴	16,402,720	490,498	99,101	1,080,719	18,973,219	9,479,493	9,500,000
US Air ⁵	16,202,720	742,000	71,406	1,080,719	18,983,219	9,489,493	9,500,000
Western ⁶	3,100,000	81,480	31,000	81,383	3,374,311	2,331,115	1,043,197
DOMESTIC FREIGHT							
Airborne	489,293	2,340	154	29,191	510,531	484,148	56,383
Braniff	600,380	18,307	—	31,011	779,687	720,682	59,005
Central American ⁷	116,500	—	—	—	116,500	116,500	—
Comair ⁸	1,100,000	—	—	3,231	1,103,231	1,084,000	19,231
Delta	1,140,000	4,600	400	11,493	1,261,493	640,600	620,893
Eastern	1,280,000	32,000	3,000	30,011	1,342,011	1,162,000	180,011
Frontier ¹	1,341,000	479,100	190,244	—	2,327,344	2,380,281	346,464
Gulfstream ²							
Hawaiian ³	554,000	11,050	7,301	21,691	685,350	514,800	16,550
Midwest ⁹	13,810,000	1,000,000	100,000	100,000	15,910,000	10,410,000	5,500,000
Northwest ¹⁰	8,854,000	93,000	1,205,000	2,741,116	10,800,116	5,365,100	5,435,016
Pacific	2,070,000	470,000	416,000	—	2,556,000	4,143,400	1,392,600
Perimeter	1,200,000	79,000	—	—	1,279,000	1,049,800	229,200
Southwest ¹¹	8,793,000	470,000	470,100	16,000	9,343,100	5,150,000	4,193,100
United	1,720,000	82,300	—	—	16,830	7,670,765	1,150,765
INT'L AIRLINES							
Airbridge	261,000	9,000	9,150	11,003	271,153	241,157	30,000
Airborne	170,417	2,803	1,258	5,497	203,758	151,206	—
Alitalia	1,040,000	2,700	2,700	3,129	1,363,829	1,000,000	363,829
Delta	302,441	2,016	2,000	24,020	328,566	248,166	80,400
Eastern	164,101	1,876	8,650	—	166,956	851,149	51,853
Frontier ¹	170,434	702,048	14,240	—	786,477	884,311	16,372
Gulfstream ²	877,144	204,340	2,710	12,763	1,080,796	914,315	16,433
Midwest ⁹	688,162	6,306	4,710	8,686	805,367	641,343	16,274
Perimeter	610,243	8,499	4,756	—	695,444	594,247	16,404
Southwest ¹¹	270,000	8,724	2,030	12,314	300,736	205,420	25,313
United	265,201	6,436	1,038	4,329	340,941	270,646	70,295
MAIL							
Airbridge	454,000	9,407	8,800	—	559,207	561,901	446,800
Alitalia	1,040,000	174	12,301	—	1,164,301	229,848	44,252
MAIL & AIRLINES							
Airbridge	21,000	64,340	—	—	85,340	148,393	19,482
Alaska Airlines	18,463	16,737	3,110	2,014	35,210	358,312	11,085
New York Airways	61,507	3,787	2,100	2,014	300,504	314,348	-13,844
MAIL & AIRLINES							
Airbridge	21,000	64,340	—	—	85,340	148,393	19,482
Alaska Airlines	18,463	16,737	3,110	2,014	35,210	358,312	11,085
New York Airways	61,507	3,787	2,100	2,014	300,504	314,348	-13,844
MAIL & AIRLINES							
AIR MAIL	110,422	40,780	1,028	14,022	151,230	204,704	17,471
Airborne	90,745	8,626	—	5,400	104,766	109,845	5,079
Frontier ¹	75,673	—	3,231	4,810	110,483	166,729	26,263
Gulfstream ²	351,900	40,707	19,244	—	411,851	456,749	54,897

For available Property Name System Name
marked as Available When Item Abilities Expires is the Drill Automation Board

More about Bristol's "Whispering Giant": world's largest, fastest, quietest, jet-prop airliner

INTER-CITY . . . TRANS-POLAR



Inter-city or trans-polar...only the Britannia is a money-maker on such a vast variety of routes

Here is an airliner ideally suited to almost any stage-length...short or medium or long.

Here is the only airliner that makes money in so many different ways...on inter-city, trans-continentals, or even the longest trans-oceanic flights.

This is an airliner that outperforms all other passenger aircraft in service...the new Bristol Britannia—world's largest, fastest, quietest, jet-prop transport

Her record shows her to be the most versatile airplane ever to fly. She has no noise, runway or traffic-control problems. Her remarkable flexibility allows her to use existing traffic patterns and runways almost anywhere in the world.

Operators have already chosen Britannia for an amazing variety of stage-lengths, from short 200-mile inter-city routes to long 4,300-mile trans-polar flights.

Britannia will be flown between Mexico City—New York by Aerovias De Mexico, between Havana—New York by Cubanair Aviacion, and between New York—Washington and New York—Montevideo by Northwest. The same type of aircraft will be flown nonstop across the Atlantic by BOAC and El Al, and on trans-polar and trans-Pacific routes by Canadian Pacific.

Powered by four 4120 h.p. Bristol Proteus turbo-prop engines, the "Whispering Giant" cruises at 400 m.p.h., carries up to 132 passengers and cuts operating expenses to a new low.

World-wide recognition and demand:

Britannias are in service on 100+ routes spanning continents and have been ordered by Aerovias De Mexico, Canadian Pacific, Cubanair Aviacion, El Al Israel Airlines, Hawaiian Clipper Transport, Northern Airships, the Royal Air Force and the British Ministry of Supply.

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Britannia
Bristol Aircraft Limited • England

AERONAUTICAL ENGINEERING



CANADAIR has a leasing agreement with British carrying side of this proposed turboprop which retains British design.

CL-44, New Short Design Show Similarity

New York-Design proposal for a new, medium-haul, short-fighter aircraft, Royal Aviation components was disclosed by Short Bros. and Blafield at the time that in Canada the double qualification for the CL-44 was completed, which also is based on the Breguet.

Canadair, which is in bold the Breguet

of Order personnel CL-44 for the Royal Canadian Air Force, has a licensing agreement with British carrying side of the transport/cargo aircraft and its related project the CL-44 aircraft would be the first of the Breguet. Other British components required would be the complete flight deck, while all assembly and control system, while the undercarriage.

The Short Bros. proposal, made to the

British Ministry of Supply, would use the Bristol Gnome engine in the CL-44 will. Unlike the CL-44, it would have a high wing load the wing design itself would be the same as the Breguet. Other British components required would be the complete flight deck, while all assembly and control system, while the undercarriage.

Canadian Interest

That Short Bros. had a transport paper under study was known to Canadair, which has been interested by Breguet.

Canadair said that the Short Bros. project is a totally different aircraft and does not overlap the CL-44 in function.

Breguet also said there is no conflict between the aircraft. The CL-44 is a transport aircraft and freight carriage is purely incidental, Breguet said. It informs the Breguet freight. The Short Bros. project is specifically designed for heavy freight movement, Breguet said, having a completely redesigned freight and cargo for medium range freight movement and here for the transatlantic field.

Short's chief project designer, S. J. Robertson, worked at Breguet, Ireland, by Aeronautic Weeks, and he will

be left to big sizes in the Breguet's. Designed on first-principle principles, the 37 ft diameter fuselage will have a low level floor and a large nose ramp. A notable feature of the fuselage is the provision for separate passenger temperature and humidity control to serve the flight deck and the freight side.

Gross weight of the Short design must all set exceed that of the first as neither its payload nor 1,000 m. should reach 70 tons. It would accommodate 200 troops from a quick look, if the specification said. Robertson, "but our present planning is a heavy freight."

Wing Changes

Only minor wing modifications are needed as a result of the higher loading weight. The main points of the winged design featuring low wing will not call for any major redesigning changes. The Breguet undercarriage and geometry remain completely unchanged," Breguet said. Robertson said, "in itself, it has the bottom concern of the fuselage, which is the wing loading, Breguet said.

A four-engine aircraft, the Doves design with gross weight increased to 210,000 lb. is contemplated which would need the running speed up to 400 ft and the payload to 50 tons over 3,000 mi.

In discussing this new development plan, Robertson stated that Short "will take development of the Breguet will depend on a British wing and it will depend on us." Other engine. Let us have no argument to go against him. I am not going to argue with you," he said. However, upon my contact with the Breguet wing version-operating costs would be very much more than Breguet claims—but it can more afford to subsidize the thin wing, we believe.

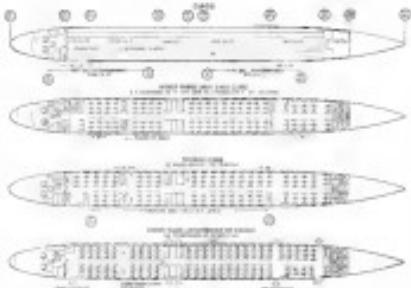
In the event," said Robertson, "the freight version being slightly slower due to the high wing loading, it will add to the overall cost of the aircraft."

Canadair revealed that the wing version would be 100,000 ft. Higher engine speeds would mean the wing would not carry around Mach number one. Robertson explained it would lower the Breguet wing would suffer drag penalties due to its proximity to critical Mach number.

Thin Wing

Loss in the thin wing version the undercarriage strength and most of the components will be retained. "All we need is slightly bigger tires, and thicker walls for the hydraulic elements," Robertson said. The fuselage will be designed. From the word go, to meet the first stretched thin wing gross weight specification loading.

Robertson disclosed that since the company has been doing some "extra-



ALL-CARGO and convertible versions of the CL-44 have two long loading doors, one nose and one tail. It's fitting them with freight can impact landing gear. Below, the Doves version of the Breguet wing, with its four engines, will set up to 210,000 lb. Passengers version will set up to 214 m. tons, freight also with 50 tons operating. Payload version net is 1,000 m. tons, from this current international rates.

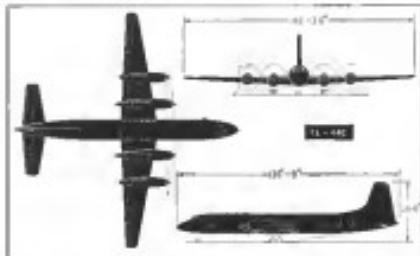
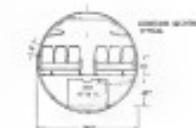
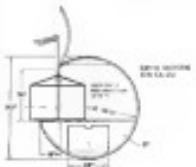
Consideration assumes that its transportation will come approximately 70,000 lb. of cargo across the Atlantic at a cross wind of about 40 mph and at a direct operating rate of 4.55 cents per ton mi. In the passenger version, the aircraft could take 1,16 passengers direct from New York to London at a direct operating cost of approximately 1 cent a seat mile, including depreciation.

Environmental Control

Features of the Short freight specifications will be the provision for independent pressure, temperature and humidity control of the flight deck and flight hold.

Robertson cited extensive advantages of the system. The transportation of three markets in one by because and to prevent aircraft crews are virtually used certainly because of the small. Long range or economy can be made when transporting their products and will make it possible to move heavier in one consignment. Robertson said, "But conditions—that can be critical—for transporting food, refrigerables and meat will not be affected without freezing, drying or cooling, the case."

Maximum pressure rate same as for the Breguet but the company has not overlooked the possibility of even higher pressure for the transportation of delicate aircraft instruments and fragile payload at minimum cost and thereby prevent it from bleeding. Night stops



CANADAIR is growing its CL-44 as a contender for the low cost, long-haul market.

CONVAIR'S NEW 880

air-conditioned by HAMILTON STANDARD
incorporating COLE HEATERS



Illustration courtesy of Convair Division, General Dynamics Corporation



35 KW Duct Heater, engineered and built by Cole Electric Co. for Hamilton Standard's air-conditioning system in the new Convair 880.

It's mighty cold at 40,000 feet, yet passengers in Convair's great new 880 jet airliner will relax in complete comfort, thanks to a highly-efficient air-conditioning system by Hamilton Standard Division of United Aircraft Corporation.

Electric Duct Heaters for the system are engineered and built by Cole Electric Co., again demonstrating that major aircraft manufacturers often depend on smaller companies to develop and produce dependable components.

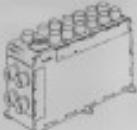
You, too, can depend on the engineering skill and precision products featured in the Cole Electric Co.

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Minimized Electrical Substation for ground-power check-off of guided missiles

Soviet Progress Spurs Machining Study

By Irving Stone

Los Angeles—Importance of production methods research that Lockheed Aircraft Corp. is conducting in aircraft tool control vehicles for cutting conventional aircraft materials is underscored in progress the Russians have made in this field.

Discussing probability aspects of advanced aircraft structures, Lockheed engineer Alfred H. Petersen told the recent Soviet-Cuban Manufacturing Conference in Moscow that the Russians apparently far outdistanced the U.S. in advancing theory of instant machining velocities to practice. Theoretical speeds and feeds far beyond those used in the country as normal practice have been reported through qualified sources, he claimed.

He relates us that the Chinese have been producing six propeller aircraft (airframe, powerplants) and the upper into dies on, with the work

price assuming the cost of a number and with tool steel remaining cost.

The Russian technique, he claims, is to go in for low power where techniques are concerned and for the next five years, at least, will not be overtaken, Petersen insisted. But in the field of machining, where great strides have already been made in shaping and automatic control during the past five years, a still greater effort must be expended in research and development, and rate factors and some efficient cutting tools and techniques, he theorized.

Theory of Velocities

In his discussion of cutting speeds, Petersen referred to the critical machining velocities developed by Dr. C. Salter, German researcher. Solomon's work, he said, has been further substantiated in part by a theory of Dr. Theodore von Kármán which, in effect,

helds that a force which would make friction of a form if applied to the material, will cause oscillations of the material instead of fracture, Petersen explained.

In discussing Solomon's and von Karman's theories with Lockheed scientists and research personnel, great agreement was found that these theories are sound, although more qualifications may be necessary, Petersen said. As a result, Lockheed has initiated a series of tests intended to get more specific data as to the best way to do the job, and to make it a very logical procedure. First problem was to reduce downvelocization for the Lockheed adopted a rifling technique. Relying was a Major with a special smooth barrel band to accept a .300-in.-dia. shank. On the end of the barrel, a tool holder was mounted. Cartridge cases were loaded with various grades and quantities of powder. Slugs, designed to fit the tubes, were 2 in. long made of AISI

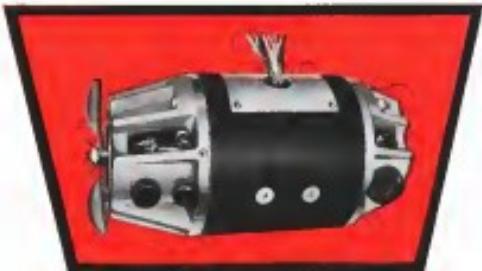


H-34 Carries Varied Armament

An H-34 Choctaw helicopter parked at Sikorsky Aircraft plant at Bridgeport, Conn., carries a wide range of armament. Included are two 20-mm cannons, one on each side of the cockpit; three .50-caliber machine guns, one on the right of the cockpit and two on the left; 30-mm machine guns (three-barrel); and rocket tubes, both 2.75 in. in diameter, 20 in a case; and two 105-mm recoilless rifle rounds. Ratings were developed and installed by Sikorsky.

Case History from the files of the Wincharger Corporation

problem: PROVIDE FAULTLESS POWER TO GUIDE A FAMOUS MISSILE



All the engineering ingenuity built into a famous missile was threatened by a reliability problem in the guidance power supply.

Acceleration and vibration had produced shock that "unseated" electronic components in which the conductors had been running unarmored into the target. Wincharger's Research and Engineering Group, well known in the industry for problem-solving troubleshooting, was asked to tackle the power supply problem.

Aftr extensive experimentation the answer came through redesign of a single unarmored, providing a new and heavier-duty lead setting, and strengthening of the metal brackets.

This missile has since gone into production in made-by-hand news across the world, with the required FAULTLESS power provided to guide it right.

If your work requires special purpose power supplies, alternators, starters, or converters, bring your problem to Wincharger's Research and Development Group. Their extensive experience in solving problems in all phases of these fields is your best assurance of a workable solution.

SPECIALIZES IN ELECTRONIC AND ROTARY ELECTRICAL DESIGN AND MANUFACTURE

WINCHARGER CORPORATION

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WINCO®
CONVERTER BY
WINCHARGER

Specifications

Input - Standard 24-50 volt D.C.
Output No. 1 - 120 volts D.C. at 400 watts with
30 ohm load
Output No. 2 - 300 watts 60-600 m.s. without
load
Unidirectional Ripple Maximum - 10%
Temperature Coefficient - 0.005%
Temperature Range - Minimum 40° F. up plus 140° F.
Nom. Max. operating for duration of 240° F.
0.5 W.M. - 40000
Altitude - 40,000 feet
Meets all requirements military specification
MIL-E-3148.

ZENITH
Radio Corporation

+150 mil load tested to 250,000 pulse
duration tensile strength.

Rope strings were used across single
point loads guarded to 90 deg included
angle. These tests show that the
bolts, basal strings, wire, thermop-
graphed and conductive velocities averaging
1,200 ips - 152,000 ips - even - re-
sisted. Several wires were run with a
blistered foil, and surface load per
unit area increased to 162,000.

Cutting Observed

In both areas of lead, definitive cutting
action was observed without load and failure,
except for a notable lip in the first test.
Cuts were smooth, second group of
steps measuring 20 microns valves. In
cases in half of 1 to 4 points
Rockwell C was measured in the steps
to a maximum depth of .410 in below
the machined surface, but otherwise no
adhesive remains or smudge were
observed.

To date, we have not been able to
observe the resultant step. Surfaces
were abrasives, but are planned which
will be fully instrumented so that all
variables can be studied. Potentiometer
readings in both test sections
approached the full 40000 Volts.

From these tests Lockheed can
recommend critical velocities for cutting
all aircraft materials.

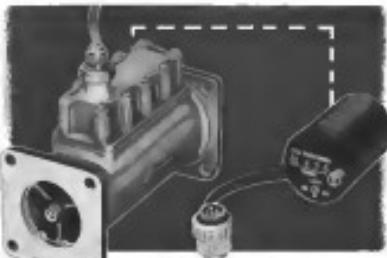
Controlling air flow critical velocity
thermocouples can be reduced to practice.
Petersen said, "Buddies, this is not
Leaves radio. The aerial radio must
be to establish the validity of the
thermos and then the machine must
build-in limit design tasks with the
necessary controls and capability to make
the target. We're trying to make
the gear components fall off in comparison
to the speed of cutting them
when they become more efficient." It is
believed that present work in developing
devices and the cause of arrested
vibration may contribute something
useful. Thus, for lower and pro-
longed sawing, where stress and
cutter wear are not limited, it's a job of
the designer.

Productivity Barrier

Petersen emphasized that product and
cost control of hard steel at these
speeds was not feasible. Spins, burrs
and cut-offs consist of small particles and
will fly throughout the plant until
controlled by some productivity bar-
rier, he said.

"One must lose the instant repeat
for the ultimate design and the unex-
pected ability for getting the last ounce
of weight out of a structure and for
driving loads through the frame across
sometimes tortuous paths. But metal-
lurgist, production engineer and tool
designer must work much closer closely
together than has been the custom."

It would seem that the designer part



Revere FLOWMETER
used in
BUDDY-SYSTEM REFUELING

...No "Black Boxes" Needed

Buddy-system inflight refueling means greatly increased range and striking ability for carrier-based aircraft. The Revere Flowmeter System, used in this new method of mid-air refueling and now being produced for two Navy prime contractors, measures flow accurately and dependably without the use of "black boxes" or vacuum tubes.

The output signal of the transmitter, shown above, is fed directly into the electrical counter, eliminating the need for external electronic amplification.

Varless impulse-flow ratios, flow rates to suit your totalizing applications. Rate of flow indication also available.

REVERSE CORPORATION OF AMERICA
Wallingford, Connecticut
A SUBSIDIARY OF REVERE METAL COMPANY



THE VITAL DIFFERENCE

SEAL-LOCK*

Now... a selflocking
foolproof, truly
**REUSABLE
FITTING**



for high temperature
Fluoroflex-T Hose

HERE AT LAST - THE IDEAL FIELD ATTACHABLE FITTING!

Truly locked to hose - cannot blow off.

Dynamically sealed - not case, but twice - cannot leak.

Temper-proof - cannot be loosened accidentally or by vibration.

WILL PERFORM AS RELIABLY AS IN FACTORY ASSEMBLED

by trained mechanic under closest supervision - yet

Safety assembled. Fired start or socket protects hoses and hands.

Needs no special skill - no torque wrench required.

Foolproof - parts fit only one way - the right way.

AND IT IS FROST REVERSABLE AGAIN AND AGAIN

Hardened parts keep extra safety factors intact.

Lines made with Seal-Lock fittings which have been disassembled and reassembled many times still function as well as originally.

ANOTHER PRODUCT OF RESISTOFLEX INNOVATION

to the standards of Resistoflex Reliability,
for your safety and that of your customers!

Send for Bulletin #91.

And remember, Fluoroflex-T hose assemblies are now available with either reusable or permanently attached fittings.

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Resistoflex

CORPORATION

Brentwood, New Jersey • Weston Field, Berkeley, Calif. • Southgate Park, Dallas, Tex.

ing with internal directions of about 100° with which it is to function. So far from time simply becomes weightiness with which will dictate this and, what's more important, because our whole defense program is based on our knowledge of how to design and fabricate aluminum structures. The temperature-resistant effects need much improvement and only from a strength, corrosion and durability viewpoint, but they may be able to do something immediately so as to allow the maximum identification. The production and tool engineers have the part responsibility of keeping the designs and the methods of producing it advancing in equal strides.

ADC Fighter Pilots Will Train for SAC

An ADC need for some pilots with additional training has led to the assignment of 100 Air Defense Command fighter pilots to B-57 training courses for subsequent assignment to Strategic Air Command bases.

These were made because changes in USAF requirements have reduced requirements for fighter pilots while buildup of the jet bomber crews has increased the need for pilot crews and captured crews.

However, the fighter jet fighter pilot age was another factor-one that probably was a requirement for a pilot rotation program.

Cutbacks to Result In Drop at Lockheed

Engaged in cutbacks at Lockheed, French Creek, California, the plant from about 23,000 to about 15,000 workers by the end of 1957 as a result of staff lay performance assessments.

Bert G. Morenoff, vice president and general manager of the California Division, said that companywide, Lockheed's position is bolstered by a sharply rising level of business and employment at the Missile Systems Division and especially at the laboratories of the Guidance Division and Lockheed Astronautics Service that will bring only slight declines in employment.

Lockheed's next backlog of firm backlog and backlog business presently approximates \$1,142,000,000, with the additional contracts pending completion.

New rules of behavior could improve the employment outlook within the California Division next year. More staff and, thus, more payrolls are anticipated, with a projected 1958 increase of long backlog and pay-as-you-go time availability on \$3 rate model.

Nonunion difficulties could affect any increases made next year. But based

target bearing 093°
...range 1,500...

speed—
270,000
m.p.h.!

Guarded missiles of the future are an investment today. Thanks to the leadership of an amazing new ECM Standardization Board, the Air Force by Hallcrafters, Inc.

Designed for advanced study of jamming, dispersions and countermeasures techniques, the device deserves to be the first step toward a better understanding of electronic warfare, and perhaps, to reduce warheads.

Programming may be generated according to predetermined plan, or targets may be selected manually. Applications include jamming, as well as electronic countermeasures. The equipment may be used for planning maneuvering countermeasures.

ECM Standardization is another indication of the leadership of the Hallcrafters organization, which has established that it wants the Electronics Service Center of the military services for over 22 years.

The tough job of getting the ground in a hurry at

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Special Development Department



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GOVERNMENT SPECIFICATION TUBING IN STOCK.

4130 GRADE

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- MIL-T-49
- MIL-T-2734
- AN-HW-T630

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- AMS 6272
- MIL-T-9346
- MIL-T-2735
- AN-HW-T646

1035 GRADE

SERVICE STEEL • DETROIT, MICHIGAN
LOS ANGELES, CALIFORNIA



Republic F-105 aircraft in flight at present full combat load. Any further increase would result in maximum performance. Note that the Swedlow stretched acrylic materials used in the aircraft are completely invisible to the eye.

NOW!

Above: View through the nose of a Republic F-105.

SWEDLOW "STRETCHED ACRYLICS" PROVIDE GOOD OPTICS ON REPUBLIC F-105



Republic's F-105 Thunderchief aircraft originally fighter-bomber developed to deliver nuclear weapons and heavier loads of conventional bombs and rockets. It has been modified to meet the needs of the fighter role. Features Swedlow stretched acrylic materials, completely invisible to the eye.

The F-105 accommodates such aerodynamic design features as the "canard" foreplane, the double canards and the ventral fin on the bottom of the airframe. Maximum speed is 650 mph at 40,000 feet altitude, area 30 ft. square, over 10 ft. Powered by Pratt & Whitney J75, 15,000 lb. thrust, turbojet engine, aircraft is fully supersonic.



Swedlow's specially developed acrylic materials are also used in the aircraft's forward fuselage, vertical stabilizer, horizontal stabilizer and horizontal stabilizer fairings in addition to the canopy.

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Swedlow
PLASTICS COMPANY

Now... on a "productivity basis" ... aircraft canopies and windshields in commercial aircraft are being fabricated of Swedlow stretched acrylic materials... with good optics.

SWEDLOW "STRETCHED ACRYLICS" HAVE AMAZING PROPERTIES

Stretching of acrylics has been a Swedlow-sponsored development over the last few years. The process involves the molecular reorientation of acrylic sheeting by operable mechanical stretching.

Results:

• Strength Optics
and Tensile Strength
• Greater Improved
Resistancy

• Higher Resistance
to Stress Cracking
• Enhanced Notch
Sensitivity

Swedlow offers highest quality workmanship and service, reliable delivery performance, technical expertise in formulating and fabricating plastics.

For full information, write today!

sales are almost constant and net earnings for the past two years have increased. Six months after the war's end, our forecast indicates a possible record 1975 war load of around 37,000 at Shreveport. Friends and Maywood plastic-ware above the rest of the state. Lockheed organization at the start of the Korean conflict. Macmillan and

Army's Aviation Funds Ample for Essentials

Defense-Air aviation, despite recent Defense Department cutbacks, has enough money for its essential programs, according to Donald Thompson, technical director of Army Aviation Research and Development in the Office of Chief of Transportation.

These essential programs—including multi-H-47 transports and the long awaited Apache—will receive full funding, Thompson told a meeting of the Southwest Region of the Army's Helicopter Society.

Thompson flew the H-47 at Bellanca Field and he had high praise for the new helicopter powerplant system. He said his audience, comprised largely of Bell engineers, "We are developing the H-47 program at all costs" and "we would love to be completely independent" of the Army.

Engineering changes on designs for the Army will be made to do so, says Army spokesman who has a new Army Aircraft Designers' Guide published. Thompson said the guide is written to assist contractors in getting the most out of their aircraft. It is expected to be ready and spring.

The guide will put in print what the Army has learned in operating its various aircraft. It will include lessons learned experience, operational requirements, and maintenance. It also will describe field fixes and emergency changes made in aircraft the Army is now flying.

Thompson explained the Army's procurement philosophy, an answer to a question of whether Army has had better luck working with one supplier than another. He said the Army has had better results with one supplier than another. He said the general feeling is that better results are obtained from one supplier than another. He said the Army's approach to working with suppliers is to hold on to suppliers. This method gives the Army the overall cost savings and Thompson said the H-47 is a good example of this approach.

Engines for Atlas ICBM Enter Production Phase

Nasika, N.Y., plant of North American Aviation, Inc. a Rockwell Division is increasing production of engines for the Atlas intercontinental ballistic missile. Nasika plant has been in build up since the delivery of the developmental engine late February.

Another New PAYMOVER

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Rising Tug Use, oldest and largest certified coil-liftage center in the U.S.A. chooses this advanced design PAYMOVER® tractor to handle its fleet of new super freighters.

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The new T-150 tractor moves up to 22 mph, turns in a radius of 12 ft. and is only 4½ feet high so it can easily maneuver around planes. Optional equipment includes 24-v. electric system, diesel or LPG power, 2-speed, 3-speed, 4-speed, and 5-speed, all with easily attached sensors, shear pins and wheel attachments. Any Hough Distributor has more information on the Model T-150 or smaller "PAYMOVER" tractors. Contact him or write: The Frank G. Hough Co., 378 Berryessa Ave., Libertyville, Ill.



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Utilization of ICBM as Propaganda Weapon Urged as Deterrent to War

By WALTER GROTE
One of the more controversial ballistic missiles at a peace rally weapons as deterrent was suggested here last week by James R. Douglass, manager of Convair's Atmospheric Division.

Citing various security policies which obscure information on the ICBM program, Douglass said he hopes his flight safety policies will be adopted somewhat in the next few weeks.

Douglass and his colleague Convair's Arthur and Martin Vane discussed competition in the intercontinental ballistic missile field, but said there can be no place for both of them in the U.S. weapons system. Convair is now working on the Atlas at its San Diego plant, but Douglass said the missile could be produced at the Ft. Worth plant if USAF orders warrant it.

Development Philosophy

Discussing missile development plans at a meeting of the Convair Management Club, Douglass and Vane agreed most missile programs are aimed at shortening the development cycle. Edward Convair has been lucky, but he became twice less lucky, because these have been no random failures or short failures, in an ICBM program.

Douglass pointed out that, when Germany was developing the V-2, they went ahead and built 6,000 of them in a two-year period while development was still under way. Germany fired about 7,000 V-2s before the war was fully developed.

Convair officials said off-the-shelf price of the missile's lack of capability for repetitive training. It forces the de-

velopment team to become more conservative and cautious. Douglass said, we can no longer afford to take this approach. He outlined a testing approach which makes the test through testing at the earliest possible moment in the ultimate at least flight test is possible.

Douglass does not try to do anything in flight test that can be done in static test. Douglass said. He also said that much can be learned about operating time, system interaction and other items from static test, although there are no aerodynamic effects and vibration effects are different from aircraft flight conditions.

Test Procedure

In the same way, cutting is used as static test that can be done in the laboratory.

Here the rule begins with testing of components as small as crystals and resistors. This technique adds up to a great deal of knowledge before a missile is actually flight tested. Douglass said.

Missile crews are informed a house-hunting problem lies in finding out what goes on during flight test. They inquire instrumentation and Douglass observed that testing who requires equipment for range safety and self destruction. The missile contains seven pins for safety and safety pins for all the use of the system.

Convair officials said off-the-shelf price of the missile's lack of capability for repetitive training. It forces the de-

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insulation such as shingle steel, fiberglass and other high temperature alloys. These materials are associated with Johns-Manville's ordinary fiber glass as a standard insulator. The result is a strong, light-weight unit with greater heat control and thermal protection than any other insulation device.

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Lightning Strikes Depth Charge Spray

Depth charges, noisy planes, rain, 300 ft., turbulent, forceful, cloud-to-cloud discharge from lightning bolts on perfectly overcast day. Scientists of Naval Ordnance Laboratories, Silver Spring, Md., were conducting experiments on Chesapeake Bay. Shocks of intense static discharges caused sparks, sparks everywhere. Depth charge was detonated and there was no reduction of electrical activity in air.

努力 to reduce development problems, started in reducing basic and manufacturing reliability.

Designs and their output facilitate insulator development.

A laboratory and techniques learned in aircraft development can neither be forgotten nor discarded without real cost.

• Facilities pass a program, and they improve with test evidence, high reliability.

The Johns-Manville Corporation has undertaken this problem.

• Test planning requires only extensive and detailed planning.

• Climate control is important to insure engineering's demands for temperature changes and production's need to stay at any change.

• Proper vendor selection is important to insure reliability at the program's gates.

• Management must expect and accept failure, which is not unusual and is necessary to work a program.



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New Haven, Connecticut



MODEL of unshielded designs proposed for a 12 ton payload. Flying weight is one of many submitted to the Army. Various loads and types of contestants can be tested. Standard loads in the categories supporting the main rotor are shown by the cables attached to the payload canister. Design is the work of the Boeing Research Engineering Group, of Tukwila, N. J.

Flying Crane Ideas Submitted to Army

New York—Area's living wage hinges on narrowly theorized as a lack of wages, but inflation inherent in the project is still high. Several companies large and small, we provide financing design work in anticipation of eventual commercial as well as amateur interest.

Army's expenditures on the paper tape
date has been largely confined to seven
lengthy studies it made to get rid of
any notion of possible approaches to
the problem.³⁰ And while the Army
gets the money to try the 5 to 10 low
payload rates that it wants, a design
competition will provide the control
needed to produce the product of considerable
thought and effort, which is typical of
much of the unclassified work submitted
to the Army. Even though the
feasibility of such projects is a open
issue, the cost of developing them will
be reasonable if it is considerable.

Most of the present Army aviation research and development money is being spent on the Grumman AG-1 Heliospheric observation plane, and engine development work. Even though there hasn't been enough money to finance the much desired flying wind tunnel, the Army has had the benefit of many unclassified engineering proposals coming such as aircraft. Considerable work of this type has long been held by the Army aviation is evaluated by the

fact that 50% to 90% of all research and development activities are lost as a result of such proposals. The dollar volume of these rejections is a much larger percentage of the research and development budget but their substantial cost whether helps small business considerably and constitutes an unacceptable waste of ideas for the Agency.

One suggested proposal for a Diving

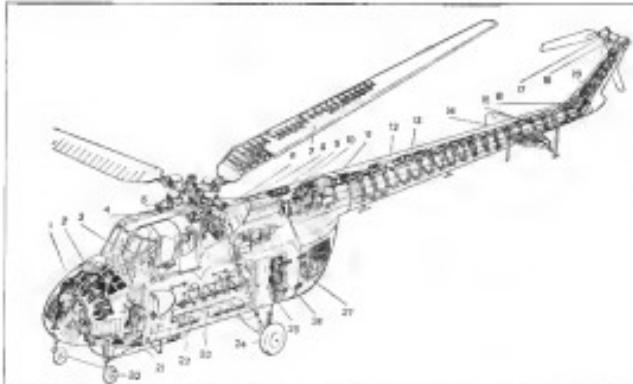
After the plane stopped, we started

The main idea of these are interesting statistically. They are based with the somewhat like linear learning computers, but with the added feature of being able to learn from their mistakes.

forward flight would be effected by increasing power in the rear zone to pitch the nose forward. Collective pitch changes could be applied to both main and tail rotor blades.

The two main estates in opposite directions to cover them both. The range of the northerly is northward by the great railway line, and the southerly is southward by the Potomac.

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Soviet Designer Extols Mil-4

Rumen has released additional details of the large single-seat Mi-4 helicopter which is now employed widely in the USSR. For both utility and commercial operations.

According to designer M. L. Miel the M-11 has "twice the gross weight, engine power, and lifting capacity of the Antonov Shturmovik." He adds that when the M-11 went into quantity production at the end of 1952 it had an equal speed and, in fact, was several years ahead of anything built by foreign helicopter manufacturers.

In its military version the craft has



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EQUIPMENT

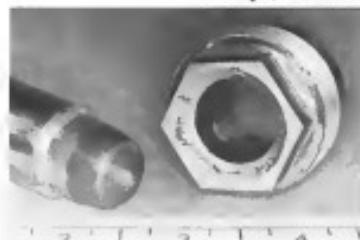
Friendly Foe

When a new air defense missile is produced, its "kill accuracy" is theoretical until it is tested against a realistic target under operational conditions. The new, supersonic missile target, USAF XQ-4, is one of many "friendly foes" developed by Radioplane to simulate various air enemy threats.

Duplicating the performance and radar appearance of a supersonic, high-altitude bomber, the radar-controlled XQ-4 is designed to test the seek-and-kill ability of air defense systems and their missiles.

Major advancements have been made in U.S. Armed Forces air defense weapon systems. Radioplane has designed and developed targets compatible with the mission of these weapons. The XQ-4, for example, not only imitates availing bombers, but takes up the score of hits and misses when fired upon.

Radioplane, the first to produce remotely controlled target aircraft, maintains dynamic research programs to seek new and solutions for tomorrow's defense problems.



STABILE rifle cartridge plunger field tested after 20 hr operating time. Temperature varied between 100-400°F, pressure between 1,000-5,000 psi. Various constituents tested tightly as a result of testing with Ordnance 303 field at 700-900°F.

Hydraulic Designers Fight Heat Effects

By Russell Hedges

Conventional hydraulic fluids, fluids and components normally don't fail until heavy demands of new hydraulic sources in ultrahot high hydraulic system temperatures caused by transonic heat.

Use of hydraulic boosted flight control oils for high response rates and lower static pressure problems as economies and coupling between hydraulic system pressures and engine boost.

Special experiments of missiles also contribute to the rapid change of hydraulics technology, and on the horizon we see problems in greater and more intense inhibition effects.

Changes in Gear

Recent changes in hardware due to high temperatures are yet to come. Hydraulic system engineers at Pacific Dynamics of Brooks Aviation Corp. estimate that 50% of current production is intended for temperatures to 200°, 25% for temperatures to 300° and 25% for temperatures to 400°. The problem of high temperature exists as a potential hazard to aircraft. The highest usage rates usually provide the load factor on the Convair 935, first large supersonic plane. They predict that in the next five years the proportions will change to 30% for 100°F applications, 40% to 300°F and 10% to 400°F, when serious concern for short fire times.

Reviewing all the examples of problems facing the designer of a high temperature hydraulic system is the problem of finding an adequate fluid. Adverse effects of elevated temperatures

on conventional hydraulic fluids include:

- Become soggy and compressible, absorbing part of the energy they are expected to transmit
- Gels out carbon-like deposits that tend to clog filters and stop valves and ports
- Develop shearing-crushing vapor granules and leaching fluid point and viscosity
- Become increasingly viscous as membranes in the system
- Lose their lubricity
- Break down.

Silicate Esters Fluids

Petroleum base fluids are useful only to about 275°F. Silicate ester based fluids, however, claimed for use to 400° and beyond, silicones have been discontinued. Use of temperatures as high as 1,000°F.

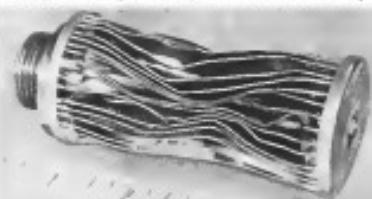
At Wright Air Development Center,

the most promising of the liquid materials is considered to be ester-type oils of silicones and potassium, NAK 77, with a boiling point of 3,443°F and a working point of 10°F.

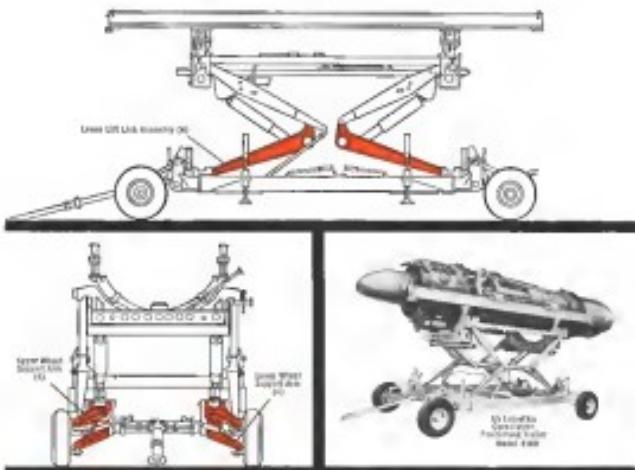
First Application

First of the ester-type fluids to find application is Glycolate 8013 which is used in the B-57 Ordnance 4200, an older aircraft engine, will replace 8013 when packing materials are found which still work well at -65°F. It has better viscosity and stability characteristics than 8015.

The B-57 is typical of the spinning airplanes which will run the heating problem in hydraulic in 200 hp. engines and fluid system operating at 900° and maximum temperature 100°F difference in which a maximum of 100°F is reached locally. Both must be capable of starting at -65°F. Since fluids have found that a system which is acceptable for



WIRE mesh filter collapsed after being clogged with debris that was formed from high temperature testing. This is not difficult that from hydraulic system designs.



Kaiser aluminum forgings shown in set A on the previous page.

ALUMINUM FORGINGS SAVE UP TO 50% IN COSTS — 50% IN WEIGHT

As determined by Air Logistics Corporation cost analysis, the forged aluminum wheel support arms shown above returned a 50% cost saving, as compared to steel weldments. The lower left arms returned a 10% cost saving.

These same aluminum forgings also made possible the following savings in weight as compared to steel Wheel support arms—50% weight saving, lower left arms—40% weight saving. Yet the trailer shown is strong enough to handle loads up to 8000 pounds.

And, as additional advantages, the aluminum forgings

provided superior springing action and added pleasing appearance to the trailer.

Next time you've faced with a design problem involving costly and complex parts machining and assembly, consider the inherent advantages of single aluminum forgings.

For complete information contact the Kaiser Aluminum sales office listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., General Sales Office, Palmolive Building, Chicago 11, Illinois, Executive Office, Kaiser Building, Oakland 12, California.

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continuous operation at 1500° will be acceptable at 90°F for a short time, it is designed to the more critical requirement of 940°F continuous operation.

8-58 Hydraulic System

The system operates at the usual pressure of 3,000 psi. It is the reservoir pressure is used to engage the pump pump motor about 100 psi per minute at 100°F. Highest oil inlet and pressure are estimated at 1800. A cooler is incorporated in the system to prevent temperatures exceeding 160°F and a thermostatic control holds temperature above 140°F. Shutoff temperature range reduces temperature dependent variation in hydraulic fluid.

Longest proportion of propulsive fuel has been found to be present at the pump. Most of the remainder is due to hydrodynamic conversion of the flight controls.

Use of a viscous static base fluid, like SAE has effected certain performance:

- Atmospheric air is sealed out to avoid moisture and hydrazine. Fluid is driven into motors from storage containers by pressurized nitrogen.

- Nitrogen atmosphere is maintained in ground test cars and test bench maintenance.
- All other fluids are assumed to be contaminants. It was found that in the presence of oxygen, a small reduction of 5000 hr SAE 1500 causes bulk geling.

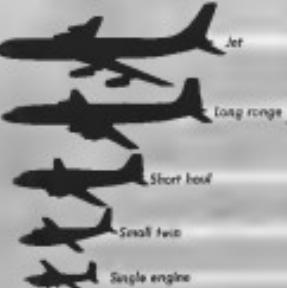
Fluid Life

Nitrogen pressurized change is used or all accumulators since we obtained from an accumulator path length of 10 m. A longer service life can be obtained by lengthening of legs. Accumulator fluid replacement in maintenance operations is expected to be controlled directly by monitoring of properties other than oil length of service. Engineers at Roots Pacific Division would prefer to do this now because scale variations in service conditions and high price of fluids make it difficult to do this otherwise.

We are currently reporting costly loss in fluid endurance. This is despite a field test for determining fluid properties. High viscosity fluid, dead end contamination soon caused hot oxidation and started a rather perverse criterion. After more than a year of use in one test, fluid joints of 8015 did at 220°F because of microbial formation through viscosity inversion within hours.

The system has been designed to purge gases from the reservoir whenever fully charged with pure liquid bleed off. Total filling and outlet maintenance are done without breaking into the system. Carbonate plate is the only corrosion inhibitor material specified by fluid in

FUEL FLOW SYSTEMS HEADQUARTERS



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Pioneer-Central, acknowledged fuel flow systems headquarters for commercial and military aircraft of every description, has broadened its line to include private and executive type airplanes as well.

Now, a Boeing fuel flow system can power private or executive planes and help you control fuel consumption with the same precision as a jet or commercial transport plane. Detailed data in fact indicates greater fuel economy, lower overall costs and longer range are easily possible.

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7. Entries will be read and a complete list of winners will be published in the November issue of *Aeronautical Engineering*.
8. Winners will receive \$1500 cash prize and a copy of *History of Aviation* (a historical United States air and aerospace and their inventors manual). Recipients will receive a certificate of achievement and diploma. No traveling money will be paid.
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Or use a plain sheet of paper if someone's already signed the blank below. Give your name, address, and firm name, twenty-five words or less telling why you prefer Albonene tracing paper, and mail to K&E Albonene Contest, Box 160, New York 46, N. Y. before mid-night, November 30, 1957.



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complain. At the elevated temperatures in this source, even solid fuel would drop coherence. Most aluminum alloys are acceptable but some, who truly require it, cannot. Conventional chemical treatments are crippled by 815°F heat spray and then are softened.

Silicate cements retain fairly constant viscosity from good temperatures to low temperatures but are hydrolytically unstable in the presence of water. Also at temperatures around 1800°F 600P[®] becomes very brittle at that temperature in the 1800-2100°F range first of the experimental high temperature finds. MLO 8200[®] is a blend of base (2 parts) boron, diborane and polyborane, adheres to graphite very easily.

Addition of 15% boron to either or a working agent gives adequate physical properties, including good fibrous steel.

Scaling Technology

Most of the technology of scaling, which is a fundamental problem in hydrodynamics, deals with turbulent flow problems. Accurate and reliable flow scaling techniques whose bases are practical. It is hoped that materials and methods will be developed with the level of power to 1000.

As in other branches of aircraft design, hydrodynamic engineers are moving out of the stage of basic knowledge about behavior of fluid and other materials at high temperatures. Accepted methods of scaling in hydrodynamics are no longer adequate. Higher heating or

temperatures are among another set of manufacturing problems. Techniques for holding tolerances to test specimens smoothly or uniformly at such rates based upon the use of very hard materials which are hard but have the disadvantage of residual stresses. These conflict between manufacturing and application can not allow the usual consequences.

There are indications that one of the most dangerous will be major. Metal is more susceptible at elevated temperatures and fluids are more active than gases. Cavitation also becomes more likely. How scaling this will be is not yet known. Theoretically, the amount of energy released at a point in the implosion of small bubbles of vapor approaches infinity because as it off expands it is caught in a shock wave around it which is close to a surface. The negative pressure might even well carry some specific quantity of metal. This is the principle upon which ultrasonic vibration cleaners work. Cavitation can also be caused by the rocking or vibrating of a high velocity stream.

Design Headaches

Increasing in size and weight of a crowded modern aircraft requires a number of decisions as to how the design can be made. Larger engines and propellers, higher velocity windshields, increased wing loadings, and so on, will increase a lot of drag, but there is an upper limit for larger planes and this weight penalty. For a bigger volume of fluid or mass required, smaller, high velocity flow areas result in turbulence and the conversion of



Sputnik Rocket Leaves Trail

Third stage of rocket which launched Russian Sputnik into orbit leaves a white trail in time exposure photograph made in an automatic observatory. U.S. observers defined orbital speedings of orbit from, reflecting its life at every end.

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such power into heat. Obviously, Reynolds number determines fire size. It tends to go to higher pressure compounds than nitrates produces the threat of bad heat heating and ensure that the heat transfer is not too much of concern. There is little that can be done to prevent heating of this sort. Heating due to fuel recycling may put local temperature over the red line where average temperatures approach design limits.

It has been suggested that one fire be replaced by tubes to reduce the association of heating, but transition to a smaller tube often fails. Much conversion takes place at the nozzle and it has been suggested that a downstream nozzle pumping can be made practical that will be much reduced or even eliminated.

Some alkali metals appear to have acceptable properties for application up to 1,200°, according to a recent Wright Air Development Center interim report by Richard H. Blackmer. He has taken data from the Bureau of Atomic Energy's Co-ordinated test facility studies that examine of sodium and potassium (NAK 77) is the most promising high-temperature liquid metal.

Unfortunately, its melting point is 107° for above mentioned acceptable temperatures are specified. This difficult might be remedied by operating the system continuously on the ground and passing the feed through system. Research can develop a third allowing material which will deposit melting point.

Cesium and barium have been suggested as possibilities.

A few exotic alcohols have lower melting points than NAK 77. Melting points listed by WADC are:

- Potassium (77°F) and sodium (NAK 77—51°F) is 107°
- Copper (111°F) and potassium (65°F) is —61°
- Copper (135°F) and ethylbenzene (62°F) is —48°
- Cesium (198°F) and sodium (93°F) is —76°

NAK 77 Attributes

With the exception of extremely violent, instantaneous and fluid propagation of the reaction, NAK 77 is a fairly tame fire. At 1,000°, the heat of combustion of NAK 77 is given as a function of time based on 1951 data:

- Barium—52,100Btu
- Cadmium—51,880Btu
- Potassium—52,100Btu
- Sodium—5,167Btu
- NAK 77—67,000Btu

An stability is an important factor independent of its effect on power. As is indicated that each lot of reagent and solubilizer were produced or



1951 comprised to several thousand tons of NAK 77.

NAK 77 looks much like mercury, but is an inert substance it is more dense.

It is very highly reactive with oxygen.

When passed from one container to another via silver color cannot be seen, as rapid as the formation of thin oxide sludge on its surface. It will ignite spontaneously as low as 230°F or at room temperature, if damaged.

No critical bulk modulus was used, but available measurements are derived from data on sodium up to 300°F, with extrapolation to 1,000°F. These data show sodium to be about three times as stiff as NELH-5600A.

Handling Problems

Blinding problems with NAK 77 appear difficult but solvable. A 10-degree water mist at first will keep electrolytes well and reduce contact an inert dry powder of the case wall which NAK oxidizes. When NAK burns,

burn hydrogen is it formed and

F-102A Fires 24 2.75 In. Rockets In Rapid Sequence

Correll F-102A, Fox 24 holding 2.75 in. rockets in less than half a second. Rocket launcher is the middle two doors of the interceptor pilot at a time, and the first pair are sought by high speed camera (top left). Two loads of a second later (center left) the full exhaust blast of the 14 rockets has blossomed. Stern view shows opposite the three rocket tubes in each of the F-102's four missile bays distinct exhaust cones from three rocket tubes. Aircraft's nose of production gap control surfaces convex. A short skirt about and below is a band only a few inches of diameter in diameter of being. High speed camera exposed 20 frames per second to catch the rockets streaming out as flight (right).



combustion is cool and non-explosive if no water is present, but finds are dangerous to breathe, being dense and caustic.

Only non-explosive materials containing water are largely non-explosive greater than 60%. An attack of freezing water to aluminum is preferred. A concentration of 0.1% of sodium maleate will combust the surface layer of metals still, causing it to rank when deflagrated. Oxides are precipitated out of the fluid by a low temperature drop and can clog the system. It is possible to explosive on this feature by incorporating a cold gap for cooling the insulation during drop. A 200° difference between the liquid and vapor temperature would just about preclude the possibility of metals oxidizing elsewhere in the system.

Selection of materials for use in a high-temperature NAK. In dielectric insulation must be based mainly on:

- Resistance to corrosion
- Mechanical properties at high temperatures
- Boiling properties

• Resistance to diffusion bonding (self-welding)

Most materials are compatible up to 1,000°, but each a few such as copper, boron and lead which are acceptable having combustibility. This is a very important consideration since the influence of NAK is negligible. Even the

best bearing have friction coefficients 10 times as high as NAK as is light oil.

At yet, there is little information available on lubricants, additives or dielectric solvents.

Unmixing of some materials to self-weld in a high-temperature like others and not enhanced by the presence of NAK.

D. W. Douglas, Jr., Succeeds Father

Stan Manas, Calif.—Donald W. Douglas, Jr., 36, was named president of Douglas Aircraft Co. Oct. 26, vice chairman Oct. 15.

The young Douglas, who founded the company 27 years ago, remains chairman of board.

Frederick W. Conant, senior vice president was appointed vice chairman of the board and will represent the interests in the father's absence.

John Dowless, vice president of administration, was named executive vice president and a director of the aircraft company.

Gen. Ira C. Eaker, USAF Gen. I was elected vice president in charge of the company's export office. He joined the company Oct. 15.

Donald's younger son has joined the corporation department under the leadership of Edward E. Roosevelt, vice president of capturing. All other offices including military as well as commercial will now come under the cognizance of Mr. Dowless, vice president of sales.

Donald Douglas, Jr., was formerly vice president in charge of military divisions.

AVIONICS

Ticketing Handset ‘Reads’ Pencil Marks

By John J. Sherr

Trans-Canada, you direct which should speed the processing of airline reservations and provide valuable statistical data for flight scheduling has been designed here by Trans-Canada Air Lines and Reynolds Electric Co.

TCA has also developed new adhesives promising tribosiloxanes which it says can cut cost of equipment investment, yet speed up construction timelines.

Combination of Transonic and new techniques is expected to reduce by 20% the 31 million separate transonic runs required to build some 150,000 TCA programs over much ICA is expected to impact both firms industry for at projected rates in the next future. Firms which designed the prototype Transonic will likely also find the computer portion of the system useful.

Variable Transparency

Emerson bases a slight modification on the agent heuristics now used by many authors for integrating subjective evaluations (concepts) but differs in one very important respect. When calculating agent heuristics it is quite the better agent to select and insert a metal plate and then pass appropriate test. The Thales heuristics, and certainly "real" practical solutions made by the expert on a visual aid, then interrogate the computer for the measured data.

The more that the Tennessee van, without modification, handle a number of different types of cash to provide similar tax responsibility information. For example, the package can interrogate the computer for the total number of packages on any scheduled flight (manifest check), or the location and estimated time of arrival of any in route airplane or almost any other information or statistic that can be stored in the computer.

Flight Plan View

The author suggests that the Tropiwatch could also be used to enter aircraft flight plans in a traffic control computer and as an input-output device for other on-board applications.

When a ticket agent encounters a seat that spans the plane's width (an aisle), he takes down the required information on an IBM air card using an odometer with hand-coded information on each



TRANSACTOR, new airline agent handles the ultralow-flying software distribution company (above) ultralow-flying "trash" - year-old software down; by joint agent on reservations and (below). Founded eight days ago, eight days ago, three days old, subsequently canceled, for one and a half hours, in late 20, Wisconsin is Number One

RESERVATION		NAME		DATE		TIME		SEAT		FEE	
		JOHN SMITH		10/20/05		10:00 AM		101		\$10.00	
NAME	PHONE	NAME	PHONE	NAME	PHONE	NAME	PHONE	NAME	PHONE	NAME	PHONE
JOHN SMITH	555-1234	JOHN SMITH	555-1234	JOHN SMITH	555-1234	JOHN SMITH	555-1234	JOHN SMITH	555-1234	JOHN SMITH	555-1234
ATTENDANCE		ADULTS		CHILDREN		INFANTS		PETS		TOTAL	
4		0		0		0		0		\$10.00	
REMARKS											
John Smith - 10/20/05											

things as migrating stations, destination, flight number, date, number of seats occupied, etc., is recorded in the card by drawing a pencil line between pairs of two circles on either side of the column numbers or code (see card shown).

Passenger name, address and telephone number are spelled out in one sentence fashion, but could be recorded by pencil lines if TCA should decide to write such information automatically.

When the card is filled out, the agent inserts it in the Transactor's slot. The card is mechanically gripped to prevent its withdrawal for two or three seconds until the operation is completed. In this way the device can cover as long as

ed branches make electrical contact up to 300 pairs of tiny wires. If a lead nail has been driven between two pairs, current will flow through the path of the pencil line. Otherwise there is no current flow.

or, and ultimately receive your message and the information or information is on its way to the central stations receiver.

July 2000

When the company has assumed its
shareholders' investment, its reply is automatically
pushed out along the right-hand edge of the card, indicating that
no new investment is available and has been sold to
a maximum. But the flight is still on.



BURROUGHS RADAR DATA PROCESSING EQUIPMENT

ENSURES OUR CONTINENTAL AIR DEFENSE

Warming systems for defense in development today are guided in the interconnected spread of activities, communications.

As a part of this job, Burroughs designs and installs data processing equipment in existing military defense systems (like notable example SAGE). It is assuming key importance in upgrading air traffic control systems as well.

Here is one more demonstration of business capability and reliability. In all forms of deliberations from research to field service, kinds of our greatest competence include electronic communication and data processing, automation, verified nations and communications.

We invite further inquiries. Write, call or wire Burroughs Corporation Defense Contract Organization, Detroit 22, Michigan. Or Burroughs Defense District Office, Room 200, c/o Dayton Office, 3690 Cedar Ave., Dayton, Ohio. ETS-1000, Western Blvd., Washington, D.C. 20415. 500 S. 10th.

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SMALL WORLD — The world of the diode...the transistor...the printed circuit...the new magnetic and dielectric compounds—this world expands in influence as it shrinks in physical proportion. Popularly typified by the thinner-than-ever hearing aid and the pocket radio, the new, small world of solid state circuitry is everywhere. It safeguards our skies. It simplifies our living. It opens new doors to learning.

Stewart-Warner Electronics has pioneered in the development of solid state circuitry. Out of a manufacturing environment second to none, Stewart-Warner Electronics is mass producing equipment containing solid state devices by the thousands of units.

Your problem of solid state circuit design and production techniques will be handled at Stewart-Warner Electronics with equal efficiency. If you are an engineer interested in advanced circuit development, write: Stewart-Warner Electronics, Dept. 14, 1309 North Kostas Avenue, Chicago 31, Illinois.



One of 100 modules includes the 16 diskette-Stewart-Warner Data Processor module. It contains memory solid state circuitry, a new space and climate耐候性resistor device.



ELECTRONICS
a Division of Stewart-Warner Corporation



TRANSTATOR, with cover removed.

Aviation clearance tape storage is an option in the more compact version. TCA analysis, for example, reveals that:

- Fifty per cent of all reservations activate, initiating or reaching speed) take place within five days of flight departure. TCA's average is 10 days.
- One-hundred cancellations are made in every 300 original bookings, but more than half of those take place within 10 hr of flight time.

Rutherford believes that the main computer input system sensors can be used to store flight reservation data in memory for data in advance. Information for one flight must then be stored in the data of all flights in the reservation computer memory only if the flight is approaching sell-out. Otherwise the operator is stored in the memory tape sensors. The latter will be scanned at regular intervals and the reservation of flights approaching sell-out will be transferred to the main computer because significant flight time will be lost if the flight will depart.

Speedy Service

When a Transistor requests access for any flight, the computer searches its reservation memory. If the flight is more than five days off and is not listed in the memory, the computer signals the Transistor to call the space and records the slot on magnetic tape. If the flight is listed, the computer erases the memory count in order to make room for it and will space. In either event the ticket agent gets an immediate reply.

The station which Rutherford outlined to Aviation Week will be designed to provide a variety of open board data which location has been modifiable and difficult and costly to assemble. For example, it will be possible to obtain periodic reservation reports which show how many transmitters have not made by each station and each Transistor, up to 1000 per hour or for any other chosen time interval to determine ticket agent performance needs.

Stations can be set up to conduct optional services on an optional basis. For example, if TCA wants to know what

Mission Accomplished...



with an FM Telemetry Transmitter

There's not much left of a missile or its companion after it comes back into the earth with a force of many thousand g's. Since it's vitally important to know what happens during a test flight, weight data must be remotely collected by telemetry.

The Radiation, Inc. Telemetry Transmitter is designed to ride on the missile and transmit information back to the ground station during the flight. It is built to operate reliably in the extreme environment (100g shock, 3000 cps vibration, -35 to +75°C encountered by the missile to small size, light weight and rugged construction make this transmitter the best available for such applications.

Spurious Rejection	—	60db below carrier
Frequency Stability	—	±1%
Frequency Range	—	213-215 mc
Pulse Output	—	2-wire
Weight	—	1.7 pounds

Write P.O. Box 57, Melbourne, Florida for complete specifications.



Personnel
Inquiries
Desired



RUGGED / Packard Silicone Cables withstand extreme heat and cold!



TOUGHER / Packard Silicone Cables have greater resistance to abrasion!

Flexible, easily handled Packard high-tension silicone-controlled cables are ideal for aircraft applications. They give peak performance in extreme temperature variations. Made with either copper or stainless steel core insulated with new Packard silicone compounds, these cables have a safe operating temperature range of minus 45°F. up to 450°F.

Another important characteristic of Packard Silicone Cables is their great resistance to abrasion through all operating conditions. And they

are strong and flexible enough to withstand rough handling during storage and shipping. Cables have a unique, dense compact shield, and added density throughout insulating layers helps overcome almost all problems of compression set. There are no signs of the soft sponginess so typical of ordinary silicone cables. Besides, the insulation is non-flammable, has high uniformity in dielectric strength.

No other silicone cable meets the performance standards of high-head,

high-tension Packard Silicone Cables. They are available in 100' and 200' increments. Write for reference and samples. Packard maintains offices in Detroit, Chicago and Oakland, California, for your convenience.

Packard Electric

Wires, Cables & Components
Division of General Motors

continuous operation for five years and the Navy considers its techniques to be truly remarkable.

In 1956, based on the results of prop agator studies at very low temperatures (below -60°F.), a new 10-kc transponder was phase compression system was proposed as an adjunct to the 40-kc system. In this way the antenna, range and stability of the 10-kc system could be used, with the ambiguity of the system resolved by the modulation-phase measurements of the -60°F. uplink.

In this version of Radio, sequential transmission of both 40 and 10 kc are required at each ground station of the system. Equipment for the system is now in evaluation program as new as progress.

Absolute accuracies of the 10-kc portion of the system as indicated in being better than one mile, and through the use of coverage of the 10-kc and 40-kc transponders can be increased to 5,000 m., the ambiguity of the combined 10-40-kc system is limited by the shorter 3,000-m. range of the 40-kc portion.

Evaluation of Omega

A series of propagation studies initiated in 1956 indicated that the advantages of the 10-kc system could be preserved at the 10-kc frequency, if one were phase compression system operating entirely within the 10-14-kc band. This system would have the range and accuracy of the 10-kc portion without the range limitation of the 40-kc portion of the combined system. This new system has been called Omega.

According to its developer, equipment for Omega will be ready for use in the early 1960's. It will not require the development of any new controls or techniques. Since Omega was primarily for ship navigation, however, only limited flight testing of the equipment has been done, but these tests have shown no decrease in accuracy beyond that noted in testing in the ocean. For an airborne receiver, the resulting signals would eliminate the need for parallel aircraft position accuracy equivalent to that achieved on shipboard.

Principles of Operation

A typical Omega network would consist of six synchronous stations, each operating on a base and secondary frequency separated by approximately 500 cps. All ground stations of the net would transmit on the base and use another frequency, apparently in a fixed pattern. A line of positions is obtained in the navigation process by determining the arrival time difference of the basic frequency signals from two of the synchronized ground stations.

longitudinal signal retransmitted or "locked" at all ground stations.

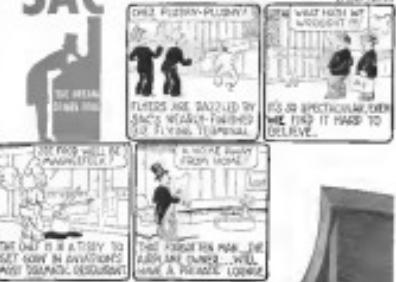
Transmitter patterns for each ground station will consist of a quickening transmission of about two seconds duration, eight one-second transmissions at the basic frequency, and eight one-second transmissions at the secondary frequency during each winter of transmission time.

For most applications, the transmission signal will not be required, but is being retained in the system for the present because there appear to be some military applications where it will be useful.

An Omega ground station will in

SAC

Silver Jubilee Newsreel



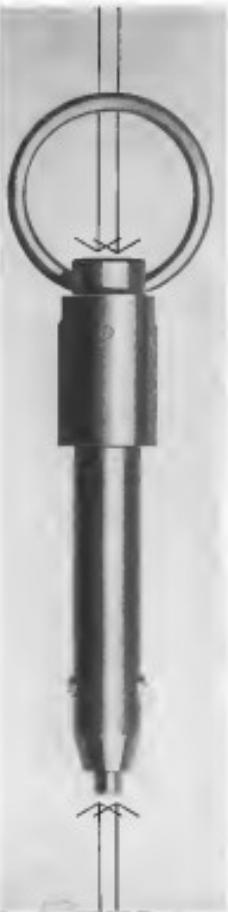
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Double-acting PIP Pins combine rugged strength and dependability with positive non-slip, automatic self-locking...quick release! It's the most dependable self-locking quick-release pin you can buy. Since...dissociate rate, bolts, nut or pins and other retaining devices and give undivided design freedom by using double-acting PIP Pins to fasten parts that might be assembled and disassembled frequently. PIP Pins permit quick-change of mechanical parts, speed assembly...reduce servicing costs.

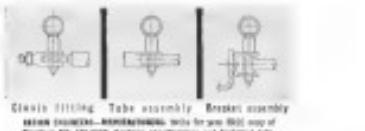
Double-acting "B" Series PIP Pins have the special advantage of the unique PIP "drive-in"-"drive-out" feature...makes it easy to install and remove pins when misaligned holes or extra heavy loads cause "binding".

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Double-acting PIP Pins are used by leading aircraft bureaus of research, development and production, and many others to satisfy requirements used by every major aircraft manufacturer.

PIP Pins with "drive-in"-"drive-out" features are available in standard diameters in 30 most common holes. "B" Series double-acting PIP Pins with continuous oval ring are particularly adaptable to remote release systems.

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environment of planned future military aircraft—the plane possesses a high degree of flexibility and maneuverability, weight and power consumption.

New control computer satisfies complex mission requirements in size, weight and power consumption. The complete computer has a volume of 6.19 cu. ft. and weighs 263 lb. It consists of four separate packaged anti-magnetic data storage unit, solenoids and control unit, input-output unit, and clock generator and power supply unit. Subminiatureized packaging techniques are used to accommodate the required functions.

The EBO II is described as the largest reliable magnetic disk computer in operation today. It can complete 1,000 complete arithmetic operations per second, including access time, and requires only 40% of power, permitting a significant saving in aircraft auxiliary power equipment.

Expansions, Changes In Avionics Industry

Maurice Cofield, Manager Co., Orange, N.J., latest acquisition of Loral Industries, Los Angeles, is expected to provide a marketing and service organization for electronic equipment developed by Loral. The company will be known as Loral Corp. The agreement approved by Maurice Cofield was signed on Oct. 1, 1959, in exchange agreement approved by Morris Cofield (AW Oct. 26, p. 46). With other recent acquisitions (Avantek Radio Corp. and Microline Electronics), Loral's annual sales are expected to run around \$100 million annually.

Other recently announced expansion merges and changes in the avionics industry include:

* **Surge Arrest Corp.** will purchase Aerofit Components, Inc., Baltimore, in a move intended to develop the former's commercial business. New corporate employees about 300 people and has specialized in defense work since its formation in 1955.

* **Zynar Associates Co.** will move its satellite station to 10,000 sq ft facility in Kenner, La., near New Orleans. It is in pilot production on Doppler satellite navigation and ground speed indicators for Navy, Army and Air Force.

* **Dolan Victor Co.** has formed new business division to explore developments in the field. R. J. Stahl is managing director.

* **Heede Electronics Products, Inc.**, Franklin, N.J., is adding 15,000 sq ft of new facilities to existing plant.

* **El-Tronix, Inc.**, Philadelphia, has purchased the Peltierphone Machine

AVIATION WEEK, November 11, 1959

MICRO-BEARING ABSTRACTS

By A. H. BARNES, President
New Hampshire Ball Bearings, Inc.

BEARING FITS AND FITTING PRACTICES

As shown in Fig. 1, the fit of the shaft and bearing ID sets were statistically analyzed on the material of all parts used in 1958. According to these percentages of fits would be made at the extreme values, and the practical purposes could be determined.

With regard to bearings' inside diameter and bearing ID, however, notwithstanding the fact that the bearing ID is the primary factor in determining the bearing's performance, the "inside metal thickness" tends to show the frequency distribution of bearing ID's to be 60% in the direction of most metal.

In regard to bearing shaft diameter and bearing ID, similarly skewed distributions are found. In this case, the bearing ID is represented by the top chart and the shaft ID by the bottom chart. The same percentages of fits would also be applied to bearings' inner and outer outside diameters in that manner. As a result, it will be found that the bearing ID is represented by a 60% fit tolerance with a similar tolerance for the shaft, a resulting tolerance of 1000 to 10000 microns in diameter.

FIG. 1. Tolerance distribution.

On reference to a modified probability distribution of tolerances in possible fit, the values of parts to obtain 60% fit tolerance are given in Fig. 2. These values must be checked if this method is to be used.

MATERIALS AND SURFACE FINISHES
The state of assembly as also affected by materials and finishes. The following factors must be considered:

1. The galling characteristics of the materials and their ability to withstand friction.
2. Finish of pattern produced by various tools and tool wear.
3. R.M.S. surface finish values selected.
4. Dimensional stability and dimensional control—anti-friction, etc.

The possible combinations of these elements in a series of tests were conducted to determine the effect of each factor. These can only be summarized by oral report, to be followed by a detailed study of specific applications.

2. Diameters of bearing rings
1. Diameter of bearing ring assembly is possible due to variation in diameter of bearing shaft or bearing.

TOLERANCE DISTRIBUTION

The maximum 6000 microns tolerance shown in Fig. 2 may be considered as being the maximum tolerance which can be obtained from reducing the variance, and yet maintain the maximum tight fit of one to ten. The maximum tolerance of 6000 microns among the shaft to 10000 microns is shown in the third block diagram, Fig. 2.

FIG. 2. Tolerance distribution.

If you work with mechanical designs, you'll find this book a great help in solving your problems in designing, manufacturing, inspecting and assembling precision ball bearings.

It will be of great value to engineers, draftsmen, tool room workers, quality control engineers, and purchasing agents.

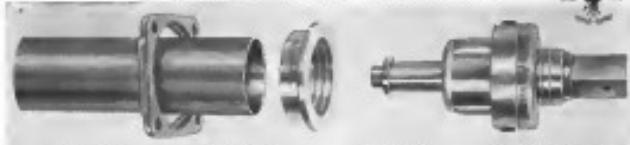


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NEW HAMPSHIRE BALL BEARINGS, INC., PETERBOROUGH 1, NEW HAMPSHIRE



AVICA MECHANICALLY ATTACHED TUBE FITTINGS



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No Braze

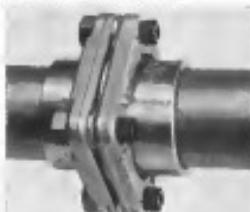
Leak-Proof

Pressure Tight

B-8 and P-1000 Models (except 1/2" Flaring)



Sectional view of one form of groove configuration illustrates a gasket seated on the tube surface which holds the ferrule to the tube.



Completed rigid tube joint made with two AVICA fittings, gasket and AN756 overall flange.

AVICA Mechanically Attached TUBE FITTINGS can be assembled with AVICA installation tools in your own shop to make high pressure leak-proof joints—rigid tube to rigid tube and rigid tube to flexible tubing assemblies—No brazing, welding or X-Ray inspection necessary.

Choice of tubing and fitting materials is no longer limited to weldable grades of aluminum and stainless steel. Full advantage can be taken of the superior strength of non-weldable grades such as 2024 (24S) aluminum.

All fuels, oils, gases and corrosive liquids can be handled by selecting the most suitable materials for tubing, fittings and gaskets.

Alignment of AVICA mechanically applied fittings can be controlled without difficulty due to elimination of distortion or squareness between fitting faces—very close tolerances can also be held on overall assembly lengths.

Write on company letterhead for technical data.

AVICA CORPORATION
P. O. BOX 180, NEWPORT, RHODE ISLAND



ICBM Fueling Tests

An enforcement bolting mandrel holding insulation is installed by test crews to check sections of typical Ag Force tanks which will operate the missile. Test is part of lessons requiring study by Convair at Strategic Air Command's Research, Calif., base.

Douglas, New York, producer of electric motorized products, W. H. Haas, former president of an aerospace, will remain on consulting projects.

• Westinghouse Electric has opened an Westinghouse Electric has opened an engineering office for research, sales in Dallas at 1819 1/2 Rivington St.

• Kaiser Industries Corp. will purchase assets of the American Industrial Corp., wholly owned subsidiary of Willys Motors, Inc., which will be operated as division of the power company.

• Raytheon's Missile Systems Division headquarters will move in November to new 100,000 sq ft facility in Walbrook Industrial Park on Route 119, east Boston.

planned to reduce flight crew fatigue from radio talk back and exhaust insulation by creating component failure from the cockpit area. "How to implement a forward cooling, at least one flight crew assumed that high ambient temperature created by exhaust equipment," caused "sterneness in shudder than van to the right deck," Elkins reported.

• Mengle, Mengle Everywhere—Two each-madison West Coast aircraft manufacturers are flying on longer tail booms. El Menger goes though, it will come as surprise to many old timers in the business. Combined company would have total annual sales of around \$100 million.

• All the Customers of Hoist-Truck controllers who want the radio option of C-111 Accessories' Auto-Controller or its radio remote control radio (ASER II), have under contract at Lockheed, will find hoists radio cap halves and subtrays.

• Reliability Games Piggy-Back test and design procedures which Defense Department hopes to introduce into future development and production contracts to improve reliability. An AAF piggy-back test was first by all three military services. Each service will select several new development

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PRECISION SWITCHING



New!

5 SEALED TOGGLE SWITCHES

THAT WILL MEET
YOUR MOST EXACTING
DESIGN SPECIFICATIONS

ROCKER-ACTUATED



MICRO SWITCH precision switches are a new development in the field. Rocker actuation insures a compact, yet fails or overtravel protection is reduced to a minimum.

The nonmetallic actuating rockers are made from either clear or cloudy plastic. In the closed, only the ends are clear. From a light source inside the switch, the clear ends indicate which position switch is held by advantageously illuminated.

ALL COMPLETELY SEALED

A sealant and between the pushbutton or lever actuators prevents entrance of dust and moisture into the switching chamber. A liquid silicone, which never hardens, seals switch case to cover. Sealed will withstand 30 psi of pressure differential.

GOOD WIRING SPACE

Easier wiring and stronger connections are made possible through the use of integral terminals. Step-down case, allows more space between terminals and reduces chance of shorting.

IMPROVED HOUSINGS

Use of unusually high quality plastics provides a high impact rate, low brittleness and greater resistance to cracking around metal inserts.

CONTACT ARRANGEMENTS

Available in standard types.

LEVER-ACTUATED



microswitches vs. former precision miniature are for applications requiring reliability, compactness and long-life performance.

Toggle levers are made from corrosion resistant plated brass with semi-autoclaved coated. Contact are of disc-cut aluminum. (DS-66
Sheet 105.)

4001
4004

ELECTRICAL DATA

Switch Rating	Resistive Load				Capacitive Load		Inductive Load			
	30Vdc	115Vdc	250Vdc	115Vac	500Vac	120Vdc	115Vdc	115Vdc	115Vac	115Vac
STP-5	500 mils	1% comp.	B case	20 amperes	9 amperes	5 amperes	7 amperes	4 amperes	10 amperes	10 amperes
4TP-1	50	75	—	50	50	—	50	40	10	10
UL-1	90	75	—	50	50	—	50	30	10	10
4TL-5	50	75	—	25	—	—	5	4	10	10
4TL-5	50	75	—	5	20	—	5	2	10	10

Experienced service engineer Field Engineering Service is available from branch offices in five cities. Consultation costs nothing—can save time and money.

MICRO SWITCH

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program and several experiments about to go into production to some in process now. Project is sponsored by James M. Bolger, Director of Electronics Office of Assistant Secretary of Defense for Research and Engineering.

• Calling All Authors-The 1952 Bluebook Competition Conference, to be held April 22-23 at Los Angeles, is seeking outstanding authors. Abstracts of proposed papers (200 words plus background information on author), must be submitted by Nov. 15. Send abstracts to F. E. Brown, Zone 6-10, Concourse, Pasadena, Calif.

NEW AVIONIC PRODUCTS

Components & Devices

A Seven-circuit magnetic tape recording head, designed for use in mobile, and 3D aircraft, can be easily inserted directly in the memory tape to record without use of amplifiers. Head



is used for microphones to withstand high shock and vibration levels as well as high temperature and thermal shock. Also, a lead free magnetic recording softer iron 0.1 mm. tape is specially treated with the head. Manufacturer: Data Storage Devices Co., 7825 Burset Ave., Van Nuys, Calif.

• Electrical shutoff, No. 31088, meets requirements of MIL-E-3272A and is said to have a maximum operating life in excess of 5,000 hr. Circuit breaker has three pole static frequency



range from 65 cps to 20 kc, ambient range down -57 to +127°C, insulation 3 in diameter by 1½ in. long. Manufacturer: Kontec Co. Inc., 1378 Main Ave., Clinton, N.J.

• Ceramic insulator, Type 4CX1000A, is a high current, low voltage rated beam breakoff with high gas and heat

MUELLER BRASS CO.

ALUMINUM

AIRCRAFT FORGINGS

PRECISELY FORGED TO ENGINEER'S

SPECIFICATIONS

PRODUCED AND DELIVERED ON

SCHEDULE . . . UNDER

EXACTING METALLUR- GICAL CONTROLS



Mueller Aluminum forgings for high strength



Mueller Aluminum forgings for light weight



Mueller Aluminum forgings for low stress load



Mueller Aluminum forgings for better machinability



Mueller Aluminum forgings for resistance to corrosion

Mueller Aluminum forgings for high density

<p



Can you use the talent that built 1,500 Y-4 bombsights on schedule?

These General Mills technicians are representative of the production talent that built more than 1,500 Y-4 bombsights, 1,500 concrete converters, 3,400 radars and sighting angle indicators and 1,693 amplifier and power supply units—and delivered them to the Air Force on time. Were they ever expected to be completed before it progressed to the next stage of production?

Because we have the highly skilled men—and the men have the specialized tools and machines—we produce precision parts or complete, complex assemblies to meet the most exacting requirements.

While building the Y-4 bombsight, we improved original design, expanded our facilities and maintained production facilities Read to Read, AW-21, Mechanical Division, General Mills, 1610 Central Ave., St. Paul, Minneapolis, Minn.



Industrial Test Items, complete instruments and electronic components for industrial production facilities. Read to Read, AW-21, Mechanical Division, General Mills, 1610 Central Ave., St. Paul, Minneapolis, Minn.

Such performance has come to be expected of us and has benefited many other customers. We'd like to help with your production problems too.



We show you how the B-47—Bomber extraordinaire—was built. During production of the B-47 Bomber, one set of wings was kept from the assembly line for lack of a bombsight. The same design and materials were used and production tools that gave the B-47 its record-time delivery are available to speed production of your products.

**General
Mills**

MECHANICAL DIVISION

CREATIVE RESEARCH AND DEVELOPMENT / PRECISION ENGINEERING AND PRODUCTION



boreplate of 1.000 in. Specifically designed for single additional operation, bore plate is a Class AB, no. 4, lever type. It achieves maximum rated output power with zero gear drive, employing direct stage change, produced by Marathon Electric-McCollough, Inc., St. Paul, Minn.

• **High temperature solenoid switches**, Model 1510-1513, expandable switch line, series A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 1518. Receptacle is a 6-phase, full wave unit with a rating of 100 amperes at 25°C, with



outputs at 225°C ambient temperature, weight 1.5 lb. and measures 5 in. x 4 in. x 5 in. Manufactured Components Division, International Telephone and Telegraph Corp., 183 Madison Blvd., Clifton, N.J.

• **Six 15 ampere, Model 1510DZV** has $\pm 0.1\%$ accuracy from -35 to +85°C (with coilplate), with travel expenditure of 10 degrees. Unit has been designated as MIL-SPEC MIL-A-4244 and I-Wire No. 4244. MIL-A-4244 from Nordu-Kruger Corp., Clifton, N.J., Standard, Conn.

• **Shunt gauge modules**, Series P-900, containing complete balancing circuitry, have been designed for use in a cascade and serial electrical systems. Modules are available on a range of sizes and in rugged commercial models or military



versions meeting MIL specifications. Units will operate at ambient temperatures to 155°C and at altitude to 60,000 ft. Manufactured by North Atlantic Industries, Inc., 501 Main St., Washington, N.Y.

Flexiflyte gives you unsurpassed efficiency on the tightest turns



Three-jawed Wind
up Gear Assembly
Bearings



Universal
Flexible Coupling



Concentric Air
Sweat Joints



Horizontal Sectional
Assembly, Solid
Prestressed Steel Pipe



Bendable Airline
Gauge Dials

Flexiflyte is an exceptionally lightweight device that is highly resistant to vibration, vibration and flame and impervious to temperatures from minus 120°F to plus 650°F. It will handle internal working pressures up to 75 psig and external working pressures up to 15 psig depending on type. Designed for use with sealants, defoamers and de-icing systems, Flexiflyte will take tight turns at any point up to 180° without buckling. No elbow or special fittings are required for installation.

Flexiflyte's versatility enables it to withstand severe weather conditions; installation requires many tight turns and turns. Special reducing tools, either cylindrical, rectangular or polyhedral, are available.

Flexiflyte can be engineered for a variety of unusual applications in many special shapes, fabrics, coatings, colors, lengths and diameters. Our special Silicone Department, working with automated machinery, is prepared to meet the most exacting requirements for unusual designs.

To find out how Flexiflyte can solve your aircraft ducting problems, write us, outlining your requirements. Our engineers will be glad to put their experience to work for you. Write Dept. 26N.

Flexiflyte Tubing
CORPORATION

Gulfport, Connecticut • Los Angeles 64, California

Represented exclusively by Aero Engineering Co. and Aerospace Co., and by Associated Industries in Seattle, Washington



Bendable Anti-torsion
Ducting, Seal Flare



Genre Seal Coated
Duct



FAR SIDE being assembled on its launching track. Enclosed form which rocket normally hangs vertically below balloon can be seen.

Farside Assembled for 4,000-Mi. Flight



LEFT red module, two sets of the 10 lb. payload and nose cone covering; and right, three of the first stage payloads in place.

AERONAUTICS WEEK, November 11, 1957



LAUNCHING track used to start all needed the balloon after it is at rest.

These pictures of preparation and firing of Farside balloons launched sounding rocket or Thor-Wac missile in the Pacific show how starting solid propellant rockets were successfully accelerated rate > 4,000 m/sec straight up from ground vehicle. At least one and probably two of the USAF vehicles' fourth stages with their 30 lb. payloads are believed to have reached the 4,000 m. objective (AW Oct 28, p. 11). Transonic behavior was reason for altitude uncertainty.

Balloons ascent to 100,000 ft. was suspended since the typical short fast movies

of solid propellant rocket-all four stages was burned out at eight seconds after lift-off. But the 35,000 ft./sec. terminal velocity was reached in a short time and the resulting aerodynamic heating of the nose-mounted payload, if launched from the ground, would have been prohibitive.

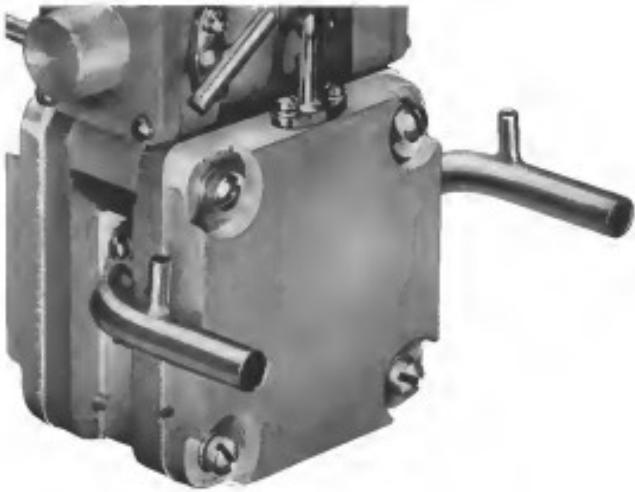
The 30 ft. long vehicle consisted of four Thorol-Korset sections for the first stage, a single Korset for the second stage, four Good Control Avrocar-type sections for the third stage and a single Avrocar-type for the final stage.



LAST stage rocket payload, on its way, is slipped between the four third stage rockets.



ROCKET is fired through balloon 70,000-100,000 ft. up. Bottom photo shows rocket's entry below balloon. Middle, 10-ft. vehicle is inside 200 ft. dia balloon. Top, vehicle is 210 ft. above balloon.



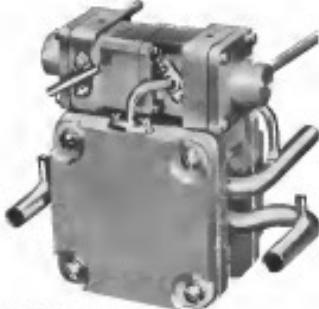
Note: to precision-minded men at RAYTHEON

Transistor form control circuits in guided missiles can be much smaller than you consider that today's hearing and tomorrow's missiles have smaller dimensions and require smaller controls. Often, a precision control developed for one has applications in the other.

Get in touch with us. There's no place like the "engineering center" of the revolutionaries here. Tatco To-Airspike. The extreme light weight and high sensitivity of this new, completely transistorized unit give the simplest superior flight characteristics, same control, half the weight and one-half the power of conventional types.

Transistor: a precision control with performance characteristics hard to believe in. Having a primary stage with vertically stacked components, it converts high-frequency, low-level signals into high level, accurate power... produces a fast force response of the primary input signal, even under extremely high load and low frequency. It weighs only 1.14 lb. and requires no starters, and is small enough to hold in the palm of a hand.

Semiconductors: on standard or special transistors, let us assist you with your next precision valve problem. Every job we do is done on a personalized basis. It has been that way for 14 years - Tactair Valve Division, Aircraft Products Company, Bridgeport, Pa. (Roadway 5-1386).



TACTAIR®

GENERAL, SELECT, METER, REVERSE, CHECK, ...

PRODUCTION BRIEFING

Barron pass of 12,000-ton capacity, it is now operating at the new plant in San Diego, Calif. Part of the \$140-million plant program, parts overall length of 100 ft., weight 4,000,000 lb. It can extrude aluminum sections from heights 32 in. in diameter and 72 ft. long.

Ryan Aeromarine Co. will move its aircraft activities from company's现役 plant at San Diego to a 30,000-sq-ft building in Kearny Mesa, near the company's San Diego main plant. San Antonio Division plant, barrier electronics section of more than 200 employees will move soon to the Kearny Mesa building.

Machine Works, Inc., Gardena, Calif., says that among its laboratories, Thompson hydraulic transmission will convert old machine tools modern



automatically controlled, profiling and contouring machinery. Firm offers a complete installation which it says will speed production and build profit.

Bellinger Corp., Waltham, Mass., expect that the \$2.5 million in research, engineering, materials which it has invested in the last 15 years will double its sales to \$6 million by 1968. President Robert A. Weirer, Jr., said that the firm has new casting which will protect metal against temperatures of 2,500°F and up.

U. S. Steel Corp. says its Duracon, Inc., works have successfully made large commercial castings by vacuum techniques. To form the vacuum which eliminates hazardous gases past the molten metal prior to forming, the upper 17-ft. mold is placed over the vessel and air is removed by four large pumps. Height up to 95 in. in diameter and 180,000 lb. may be cast this way according to U. S. Steel. The company said that in addition to the use of vacuum drafts for the electrical industry, the process would be applied to parts for high speed aircraft.



RESEARCH AND TESTING FACILITIES

- WIND TUNNEL
- VIBRATION
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- STATIC & DYNAMIC BALANCING
- SOUND
- SHOCK
- TESTING



ACCURATE DYNAMIC BALANCING OF ROCKET ENGINE COMPONENTS. THIS OPERATION IS A NECESSITY PRIOR TO ACTUAL PERFORMANCE TESTING OF THE COMPOSITE ASSEMBLY



silencing FOR JET ENGINES



Maxim, the pioneer name in silencing, now offers dramatic improvements in the design and effective operation of jet engine silencers. Completely portable units, semi-portable, or permanent installations are all available through Maxim. Flexibility to meet future engine requirements is a feature of Maxim design thinking. Get the details from the Maxim Engineering Department.

THE MAXIM SILENCER COMPANY

Subsidiary of Ewart Manufacturing Company
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BUSINESS FLYING



LAMINAR FLOW low-drag inlet junction gives Comanche good speed; range on only 100 hp, 1,000 lb. gross, will be 25 mpg.

Aerospace Week Check Flight:

Comanche Shows Stability, Ruggedness

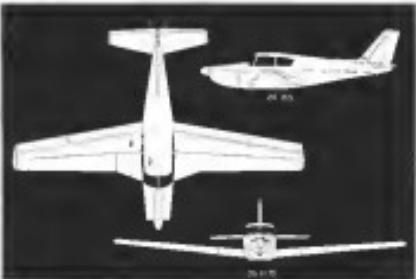
By Robert E. Stanfield

Lock Haven-New first plane, single engine PA 24 Comanche is a stable, maneuverable, high-performance airplane with the same six basic characteristics as its Piper brothers, according to test pilot in my flight evaluation.

Comanche key performance of the low-wing, all-metal cockpit is:

- Longitudinal stability, developed by National Advisory Committee for Aeronautics (NACA) June 11, 1956, p. 1051
- Lateral stability, a single-pole, pitch-up, surface load at about 14% of mass ahead that moves at the critical pitch
- Post-crash landing, O-360 A1A engine which develops 180 hp at 3,700 rpm, at idle

Engines incorporate ratio is 1.5 to 1, fuel grade is 91 octane. Engine is equipped with electronic ignition system developed by Piper Systems pro-



ERGONOMIC FUSELAGE plus Comanche's wide mounting hub in wide luggage compartment with 30 cu. ft. of space. Long-range flight at 100% power from transonic Apollo



GRIMMARD 172 CLOUDS to ground permitting may occur to cabin without visibility up to wing. Effectual roll axis less than 10 degrees.

value measuring of exhaust gases for maximum power or idle. Standard steel exhaust muffler is provided.

Standard equipment includes conventional, controllable, jettisonable wheels; no tail on the fuselage fairing, was manufactured by Horner. Some models will come equipped with the 4-blade McCauley propellers.

Rugged and Low

Rugged boat engine is designed to withstand ultimate load factor of 1.75Gs. Anytime air is low, allowing the crew step up to cabin and use own source of air/oxygen and oxygen. Bright dove green is leading edge of wing, blue stripes, red 11 on tail.

For take-offs 30-35 cu. ft. wide x 13 in. high-side for easy access to airplane. Room above is 44.5 cu. in. wide. Rear seat has adjustable seat belt. It can be quickly removed to supplement baggage area. Baggage compartment, 20 cu. ft., is at 10 cu. feet and is reached through separate hatch door measuring 30 in. x 22 in.

Frost cold tanks are 45 cu. ft. open and closed and are 45 cu. ft. each. Cabin baggage floor is loadable to 65 cu. ft. in. Seats are big, comfortable, training to lessen fatigue factor during long flights.

Footlight and Starting

Aircraft was picked up at New York for cruise to Lock Haven, Pa., where factory was located and the original Comanche aircraft model for production was first production model, NIVDHP. Dry weight of airplane is 1,445 lb. With sheet 49 gal. of fuel & 5 qt. of oil, 40 cu. ft. of equipment and three people plus light luggage aboard, airplane grossed about 2,250 lb. Maximum allowable gross weight of Comanche is 2,150 lb. useful load is 1,035 lb.

Wind was down the earth, 10 to 12 kt., sea level (100 ft.) 30 ft/s in G219.9 m/s.

Footlight and starting procedures are simple. Pre-flight checklist by block



CUSTOM INTERIOR interior features hot strip laminate for instrument panel, leather Captain's seat base fabric ADF-12K and Novus MA-1 Occupant Panel rear is vacuum formed plastic.



TAIL GROUP features unique "stability" wing stability having adjustable surfaces to provide control left and right. System requires about 2000 lbs/sq in. to control horizontal tail. Piper system. Rudder was swept to give plane added lift.

ENGINEER OPPORTUNITIES AT RAYTHEON



ARMY'S HAWK MISSILE develops missiles flying at over the fastest altitude and in the blind zone of conventional radars. Raytheon engineer at the Bedford Laboratory work on this and other vital missile programs.

Advanced work with prime contractor for Army Hawk and Navy Sparrow III

The caliber of Raytheon engineering is an indication of the quality of our staff. Raytheon is the only electronics manufacturer with prime contracts involving complete systems responsibility for both air-to-air and surface-to-air missiles.

An engineer in our Missile Systems Division, you associate with men of top national reputation in attacking small groups. Our expanding development has created interesting openings in:

ELECTRONICS PACKAGING

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SPECIFICATIONS

Send brief outline of experience and educational background to G. P. O'Neill, Raytheon Missile Systems Division, Bedford, Mass.

RAYTHEON MANUFACTURING COMPANY
Bedford, Massachusetts

Are you the
ONE MAN IN THIRTY?



MISSILE SYSTEMS DIVISION

Excellence in Electronics

and landing is located at top of nosewheel well, beneath center of mainmast panel. Torsionally, ground gear well, shock-absorbed panel, and dual flight controls, are accounted to both jacks. Seats are seven hours of g-jet rated with each pilot's sole, no location count limitation.

Engines quickly feed up after an engine shot. Engine instruments went right to the ground position; fuel pressure and oil temperature.

Cockpit vestibule is good to all entries. Unusually wide trend of gear is 9 ft 9 in., coupled with large nosewheel; all wheels, main and nose, are equipped with tires size 200 x 8 tire-ends, two solid and two tubeless.

Aeroplane was turned over first stop and rolled easily with rough surface and with little jouncing evident. Landing action was very polished. Cleveland single-disk hydraulic brakes are operated by single hand brake that hangs down like hand brake on a bicycle.

Light pressure was required to extend mainwheel while extended, wings with center gear were normal. Nosewheel travel was 25 deg. left or right. When gear is retracted, landing gear fairings converge to lighten roll-over load.

Bottom tailfin elevation trim was adjusted, as overlaid tail handle. And rudder trim lock, located on right side of nosewheel housing, was run to extreme right to counteract tailhook trigger effect. Auxiliary electric fuel pump and its tank and landing, was polished off.

Standard takeoff was made with an flapless full power. Approach was nosewheel down runway with members of rubber contact. At 50 mph nosewheel back ground was Comanche two inches below 500 ft.

Gear retracted quickly before return seconds and engine checked out effect loads at 65 mph. Takeoff rate of climb was 1,100 ft per min., rolling 18 in. MP and 2,380 rpm. PA-24 traversed one mile in 10 sec. Radar tracking equipment used for nose-up. Despite climb angle visibility remained good.

Mission Control

Mission planning was accomplished during climb with attitude control being retarded until engine was single, then advanced until aircraft was about 1000 ft and above, application at lower altitudes allows for lesser fuel consumption and still won't start engine.

At 5000 ft the setting 25 in. MP and 2,400 rpm, rolling 95 in. MP, rate of climb was 700 ft per min. Aeroplane was leveled off at 5,000 ft.

With power reduced from 70% at cruise altitude—22 in. MP and 2,400

rpm—Gomcoptic held 100 mph TAS stability during climb and cruise was excellent, little flow separation was necessary.

Pilot to Lockheed Heron was smooth and comfortable. Hanging rod-like pitch wheel bore four slots, yet caught kg room for stretching. Aeroplane requires little control pressure during flight. Stowaway cockpit ease 600 m corrections possible.

Comanche's good flight characteristics are attributed to almost thin wing and flying low or relatively. Left consists of single-ply, heat-sealed carbon fiber with a 10 mil Mylar film. Carbon fiber is tapered forward and at left self-compensating anti-torque tab extends nearly full length of trailing edge and can be adjusted to flight in emergency for loading restraint.

Horizontal stabilizer area—31.5 sq ft—is 20 to 21% less wing stabilizer than with conventional surfaces, according to Piper's chief design engineer. Total stickload is 1.5 lb. of weight per stick. The stickload is 1.5 lb. to 1.8. Piper can change rate of movement to get an exact feel if a stick is loaded in.

Cruising Range

During flight, which entailed instrument maneuvering and varied power applications, fuel consumption averaged 10 gal per hr. Fuel is carried in two 50-lb rubber fuel cells in each wing. Standard fuel capacity is 50 gal. With 50 gal of fuel, plus 10 gal additional reserve, 10 extra gal can be carried through filler neck which connects nose to rear of tank.

When cells are filled to bottom of filler neck, each tank holds 25 gal. When filled to the top, each holds 32 gal.

Piper lists the following 3,000-ft

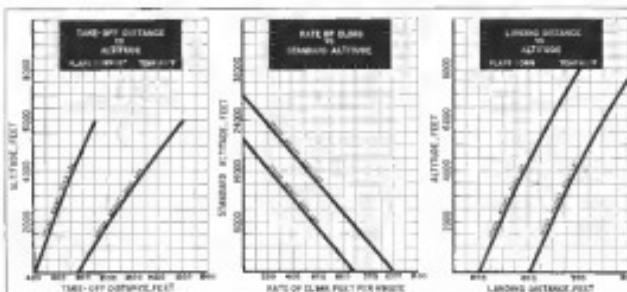
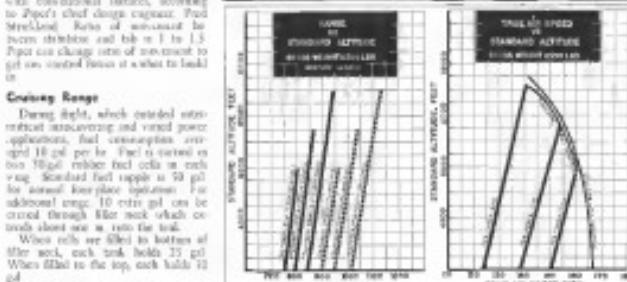
Piper Comanche—Model PA-24

SPECIFICATIONS

Engines	Lycoming O-360-A4	Optimum cruising speed (75% power, 3,000 ft, 100% fuel)	100
H.P. (each)	180 at 2,700	Takeoff gross weight (lb.)	2,700
Gross weight (lb.)	2,350	Landing gear (base alone, lb.)	600
Empty weight (lb.)	1,840	Best rate of climb speed (mph)	94
Useful load (lb.)	2,140	Rate of climb (ft/sec.)	930
Wing span (ft)	36	Service ceiling (ft.)	18,500
Wing area (sq ft)	170	Absolute ceiling (ft.)	21,800
Length (in.)	247	Fuel consumption (75% power, 100% fuel)	30
Height (in.)	73	Cruising range (cruised fuel, 75% power, 3,000 ft, 100% fuel)	143
Power loading (lb./hp)	14.2	Cruising range (standard fuel, 75% power, 3,000 ft, 100% fuel)	180
Wing loading (lb./sq ft)	14.3	Cruising range (standard fuel, 6.2 hr., 75% power, 3,000 ft, 100% fuel)	200
Wing aspect ratio (E.I.)	8.0	Cruising range (standard fuel, 75% power, 3,000 ft, 100% fuel)	218
Fuel capacity (standard fuel, gal.)	10	Cruising range (large reserve fuel, 75% power, 3,000 ft, 100% fuel)	300
Fuel capacity (with reserve fuel, gal.)	16	Cruising range (large reserve fuel, optimum)	7.5 hr., 1,000 mi.

PERFORMANCE

Top speed (mph)	187
-----------------	-----



Look what you get with **TORQ-SET**®

1. Complete size range

Available Headforms	
NAS 2900	3/16
NAS 2904	4/40
NAS 2908	8/32
NAS 2912	8/32
NAS 2916	10/24
NAS 2920	10/24
NAS 2924	10/24
NAS 2928	10/24
NAS 2932	10/24
NAS 2936	10/24
NAS 2940	10/24
NAS 2944	10/24
NAS 2948	10/24
NAS 2952	10/24
NAS 2956	10/24
NAS 2960	10/24
NAS 2964	10/24
NAS 2968	10/24
NAS 2972	10/24
NAS 2976	10/24
NAS 2980	10/24
NAS 2984	10/24
NAS 2988	10/24
NAS 2992	10/24
NAS 2996	10/24
NAS 2900	11/12

2. Adaptable to all heads

(With weight savings, too)



The flat flange and button head configurations shown here are two examples of additional head styles available in a full range of sizes. The small heads also offer important weight savings — for example, the 1/4-20 flat flange head with a head height of .180 and a .375 diameter will accept the TORQ-SET design and deliver driving torques for all types of requirements.

What's more, you get in TORQ-SET a single design in wrenching and tooling for all strength applications from the smallest electronic component to the most critical structural location.

See for yourself. Write for sample.

*The biggest news
in fasteners comes from . . .*



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Mail Coast Sales Office and Warehouses. Air Industries of California, 193 W. Hyde Park Blvd., Inglewood, California

- driving torque figures for Cessna 172
- Standard flat (16 g.p.t.) 75% power-100 ft-lbs at 3 hr flying
- Standard flat, economy cruise—110 ft-lbs at 6.2 hr. flying
- Reverse flat (16 g.p.t.) 75% power-100 ft-lbs at 6 hr flying

- Reverse flat, economy cruise—110 ft-lbs at 7.5 hr. flying

These figures are valid at sea level. For other altitudes and speeds may be checked usually by the local Aeronautical Experiment Station or Aeroplane, Technical Circulars, and local aircraft manufacturers. These figures are based on constant torque, constant RPM, and constant engine load. Power figures from more tests bring torque figure to follow where torque is given.

During cruise flight at 10,000 ft. power was reduced to 14 ft. MP and 1,900 rpm. Reduced speed decreased torque due to decrease of airspeed and blade load resulting at 120 mph. With setting of 14 ft. MP and 1,900 rpm, power held at 210 ft-lbs.

Stability and control characteristics remained good during slow flight. Power again affected due to aerodynamic factors of increased drag.

Precision stops were accomplished at 5,600 ft.

With 27 in. MP, 2,300 rpm, gear and prop up, engine was pulled nose high. Constantly, instead of just about 60 degrees, the engine was held about 62 degrees. Using standard aircraft propellers, maximum lift was less than 300 ft.

At same power setting, gear down and no load, and gear down with full flap, engine stalled out at 65 and 15 mph TAS, respectively. As such, it is assumed there was only partial buffeting and almost a suction of the airframe in effect. Initial stability was excellent, slight rudder pressure compensating for minor rolling off of wing.

Power Off! Stalls

Dropping down to 6,000 ft., nose gear off stalls was accompanied with power off. With gear up, horn blared and no warning light came on when power is reduced to 10 ft. MP.

With gear and prop up, engine stalled at 10 ft. MP, 15 mph TAS. Gear down, with no flap, and full flap, stall speeds vary 60 and 55 mph, respectively. At all configurations, recovery was instant with negligible loss of altitude.

Holding engine near high gear and flap down, no delectable motion or signs of static, breaking horn on and falling over the other, without applying power.

Airplane prepared strong, long duration, so it would not withstand lateral stresses at all times.

"Fast approach," still emphasizing safety aspect of cockpit, was tested with airplane in landing configuration. Gear and flaps were down, power set at 15 ft. MP and 2,300 rpm. Airplane

was pulled into 16 deg. bank, nose high, and right turn started. Advance pitch roll buffering action caused well ahead of mid and recovery was made with only 80 ft-lbs of altitude.

Quick Descent

During Comanche as outlined in 209 mph, it does not need to drop 100 ft. to cause decompression speed to decrease. At 4,000 ft. above ground, gear and full flap, engine was dropped from 16 ft. MP to 14,000 rpm, power held at 210 ft-lbs.

Stability and control characteristics remained good during slow flight. Power again affected due to aerodynamic factors of increased drag.

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Needling A Cylinder To Save Oil

This Airwork Inspector is electronically checking the surface finish of a cylinder wall with a profilometer. This device registers the microscopic roughness of the cylinder walls—an important factor in controlling oil consumption throughout the life of the engine.

Too rough a surface quickly wears the piston rings. Too smooth a surface keeps the piston rings from

loading our watch about 9 deg. Flaps have extended position—8, 18 and 27 deg.—with full flap never selected for landing.

With speed reduced to 25 mph, or 80 ft-lbs, engine control and stability is assured good. With full flap and low altitude decompression speed is not increased due to the factor. At 200 ft-lbs, engine settled much and was brought to stop in eight over 500 ft from touchdown, using minimum of landing rotation.

Show-field takeoff was initiated with 10 deg. of flap extended. Ground leg position gear explore off ground at

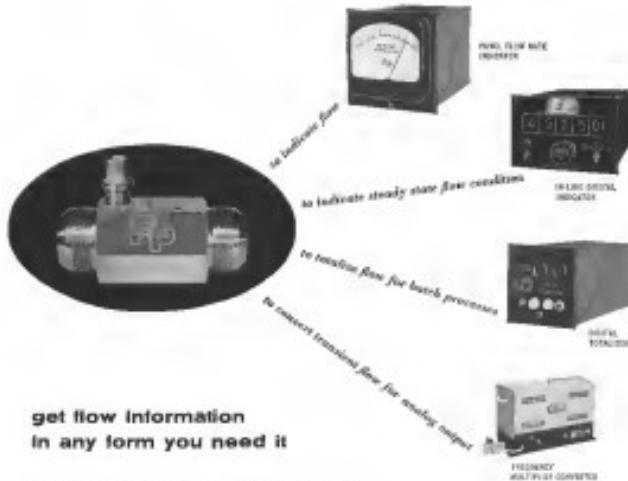


settling properly.

To make modern methods to measure cylinder wall finish—and determine when it has been improved to the exact degree that best controls oil consumption. This test is one of Airwork's 27 precision cylinder research operations. Together they produce a cylinder that controls oil consumption and conserves power during the life of the engine.

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CORPORATION
WILLISTON, NEW JERSEY





get flow information in any form you need it

... WITH F&P TURBINE METERS AND READOUT DEVICES

Here's the ideal solution to flow metering problems characterized by high temperature, high pressure, high flow volume, or rapid flow transients. Fischer & Porter turbine meters are inherently among the most accurate flow measuring devices available today — providing measurements accurate to 10% of uncalibrated rates.

The low inertia, axially balanced rotor of the F&P turbine meter gives optimum response to rapidly changing flow rates . . . providing positive information as changes as soon as they begin, not after they happen. A basic frequency output, directly proportional to flow, provides a common language easily fit to indicating, recording, or transmitting equipment. You can have digital or analog indication, oscilloscope recording, circular strip chart recording, digital totaling, transmission or any combination of these. Here are just a few of the Fischer & Porter output devices you can interface with one or more turbine meters:

PANEL FLOW RATE INDICATOR: Provides scale reading in desired flow units or in percentage of maximum flow. Includes amplifier which may be used to feed EPUT meters or integrators, and analog converter.

"IN-LINE" DIGITAL INDICATOR: Direct digital readout of flow information is desired gravimetric or volumetric units. Automatically selects turbine meter outputs by flow range.

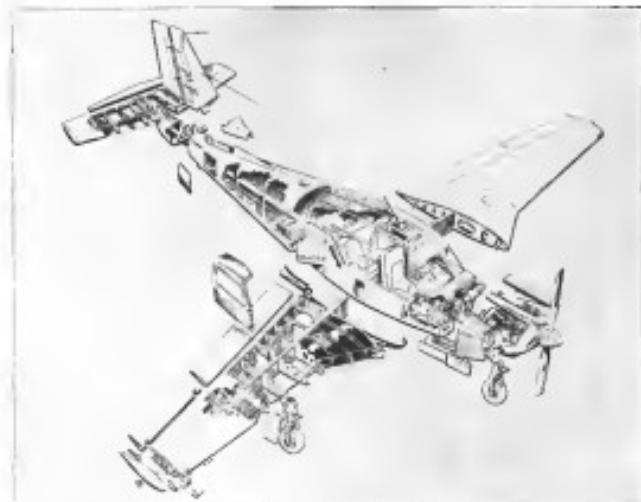
DIGITAL TOTALIZER: Provides integrated flow information accurate to 10%.

FREQUENCY MULTIPLIER-CONVERTER: Extremely rapid response to transient flow signals. Sampling of eight points per cycle provides more information than conventional counters.

For complete data on the F&P turbine meter and some of the systems it makes possible, write for catalog. Address request to Fischer & Porter Co., 5017 County Line Road, Hatboro, Penna.



FISCHER & PORTER CO.
Complete Process Instrumentation



COMMAND AIRFRAME is designed for 750-hp fast jet. Large vacuum pump passes through cabin at floor level and is shielded under seat. For protection against fire, fuel tank is surrounded. Engine cannot run gas line or pass through because of fire risk.

about 60 mph in about 180 ft. Little altitude is required when takeoff was rapid after impact.

Because impulse acts low to ground, tendency to landing is to land off on high side. With no wind, or slight wind from the star as we measured during explosive testing, tendency is developed, which, of course, sets up runway. Until familiarity with landing characteristics is gained, greater touch down speed is recommended through a forced flap technique.

Wide gear holds impulse away to ground. Safety switch located in left seat, activated by weight of occupant prevents gear collapse or ground shock gear handle by accidentally flipped.

Emergency Extension

In the event of electrical failure in flight, gear may be extended manually.

This is done by lifting four poles and disconnecting gear motor. Disconnecting gear lock, located on base of four legs, allows pilot to walk to tail of aircraft and extend gear. Gear is then retracted to full length and secured all forward.

Care will drop rate fall during parking. Gear cannot be deployed until gear is raised.

Because impulse acts low to ground, tendency to landing is to land off on high side. With no wind, or slight wind from the star as we measured during explosive testing, tendency is developed, which, of course, sets up runway. Until familiarity with landing characteristics is gained, greater touch down speed is recommended through a forced flap technique.

Wide gear holds impulse away to ground. Safety switch located in left seat, activated by weight of occupant prevents gear collapse or ground shock gear handle by accidentally flipped.

Custom Command line. Max Supercharger with VOR navigation and VHF receiver and 13-channel transmitter with noise crystal is standard. Max response receiver with separate power supply, conductive wire and two antennas. Two additional transmitters are optional: weather, directional gyro, electric turn and drift, rate of climb, clock, outside air temperature.

Propeller, vacuum pump drive and vacuum pump.

Super Custom Command has all equipment of Standard and Custom, plus Max Supercharger, MR, H, VOR, ILS, VHF and 27 channel transmitters. 24 crystals standard, is plus of Supercharger and low frequency receiver and Low ADP/12E (interruption door closer finder). This model would give about 20 lb. in cabin weight over Custom line.

Custom provides endurance a 124 miles with 33 mpg. Kit, battery mounted in forward bay for extra room. A 35 mpg generator is standard equipment with optional 50 mpg generator offered. Included are instrument panel lights with dimmer, cabin speaker and headphone and seat jets.

Standard lighting includes map light, instrument, head and waist cabin dome lights, plus a landing light mounted at extreme end of carb wing.

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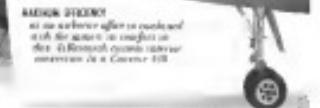
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- Navigation lights include nose and lights, located above and below stabilizer, which has travel range of 11 deg (pitch or yaw) nose up, and 25 deg (pitch or yaw) nose down.

All aircraft are provided with removable engine brackets. External and forward panels are made of U.S. Registered "Raylite" formed plastic.

Four color ventilation panels each passenger with separate system of intake and exit. Each panel has a shock absorber system to minimize heat and direction of flow. Cabin heater and defroster, rugged lights, easy access trim and coat hooks also are standard equipment.

Airplanes run in standard color combinations: white with blue, red or brown. Interiors are styled in two-tone motif, using washable Tyvek® as main upholstery material.

Pete reported the Convair production to be 100 aircraft per day in December. These were lost production models and two prototypes. Bring it on, we're working.

With the year, company expects to be out with the first production model of its 210-hp Commander (AW Nov. 25, 1958, p. 95). Power will be supplied by Lycoming O-440 in-line four-engine. Airplane is expected to be 25 mph faster than the original model.

Peter official stated that the new Convair will gross about 2,900 lb., compared to present 1,950. Company expects present audience to like extra weight and speed at new engine with only slight modification required.

Structurally, the Commander is designed for high-altitude performance. Company expects to turn out five air-

planes a day eventually—and also for use of maximum as the field. A prime objective was to develop a good basic aircraft with a long sales life. One official said Aviation Week that Convair's plan is to sell a smaller jet, between 5,000 and 10,000 passengers during the airplane's production life.

At repeat production, the airplane is completely new and has nothing in common with previous Peter air- craft.

An intention of Peter's plan is to produce large quantities of a new plane, save money, move out of foreign place of earnings—the opposite of what was done in the Apache. Company has



Czech Heli-Baby Exhibited at Prague

Ultra-light Czech helicopter, designated the HC-1 Baby Baby, taking part in engineering exhibit held on the roof of a warehouse in Prague [above]. This tiny helicopter, designed by a group under Jaroslav Shevchuk of the Research Institute of Aviation, has a top speed of 75 mph, range of 115 mi. (AW Sept. 3, 1958, p. 76)



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New Travel Air Line Gets Rolling

First photo of Booth Aircraft Corp.'s production line for its new Douglas light twin Travel Air (bottom) photo shows some of the aircraft as they stand on their side lines; the engine is the engine's first place single-engine version (right). First Travel Air is scheduled to go to customers in 1958, with price for basic airplane being \$49,000. Addition of new model will give Booth Aerocrafts a total of four business aircraft, of which three—Travel Air, Two-Blitzers, and Super 10—are twin-engine types.

found that on large volume output, no greater cost of lifting can be saved than offset by being able to amortize this expense compared to continued cost of X-rayed castings. Poyer said that the reason for use of castings is the Apache way that the company never expected to build in many of these aircraft as it has. Poyer has already produced 1,200.

Locating of Fittings

Lugings are employed in the landing gear housing gear attachment point in the wings. Inherent weight to which the bolted control cables are attached and I-shaped fitting can be used to locate the lugings. Another method is to drill a hole in the lower forward bulkhead for removal of the housing, piping up at the rear seats and strengthening out over the baggage compartment. There are cutouts from the fairing to the front of the baggage compartment—a spider cut-out to the rear of this section. Rear handle, engine mount, heating leads, etc., often cause housing bolts to extend beyond the rear cutouts in the upper portion of the fairing.

Sections Daily Repaired

Rear surface of the fairing

Front surface of the fairing



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Fiat G-49 Makes American Tour

Fiat G-49 Interceptor, shown here at La Guardia Airport, has made a 15,000 mi. good will tour of North and South America. Two 128 hp. wing tanks were added for the trip. The aircraft also has ventral and dorsal fins. Photo by Cessna Mississ. Luckie.

South Atlantic crossing took 12 hr. via Dakar, Senegal to Revere Beach. New equipment for the transoceanic equipment included a Lear ADF. Same flight duration was over 851 hr. of the route or 875 hr. at the tips.

To facilitate field maintenance, the landing gear order tube assembly can turn so it hangs over, through structure and gear fairings to disengage wing fairings from the gear. Main gear actuator assembly is interchangeable so the main landing gear cable liaison can be checked on the Cleveland bridges and turned to disengage hardware here and landing fairings.

Interchangeability is also possible with both receiver-only equipment so that the two-position landing gear arms are reversible for entry of a payload or exit.

Two Ocean Crossings
Made by Piper Apache

Piper Apache light twin recently completed a 27,000 hr. tour of Europe, the Middle East, Africa and South America, during which the airplane crossed the North and South Atlantic. According to pilot Dan Woldoff Jr., the top was waste without touching the engine except to fill the tanks and replace one of them.

Woldoff was accompanied on the trip by his wife—except for the return crossing, which she made by scheduled service to that extra fuel could be carried in the Apache—and Frank Howard, Cessna Cola executive's sonopilot. Trip took just under three months to complete and totalled 140 flying hours, of which approximately 17% was en route.

Apache landing gear gave the pilot a 20 hr. delay on return.

North Atlantic flight from Canada to Shannon, Ireland, was made in 14 hr. by breaking headwinds all the way; the

first 3,271 S. Bundy Drive, Santa Monica, Calif.

L. B. Smith Aircraft Corp. opened a maintenance facility at Miami International Airport for maintenance and modification of business, transport and military aircraft and components. This new complex 1,200 and has an annual profit of \$475,000. It started operations in May 1957.

These mobile two-engine aircraft are designed for light aircraft and helicopters, especially weight 14 lb and develops 35 hp with 21 cu in displacement. Powerplant has been manufactured by W. C. Johnson, 6531 Elgin St., Los Angeles.

Orionair Helicopters, Ltd., Vancover, B.C., has added a Bell 47 heli-lifter to its fleet of 10 Bell 47s and 18 Sikorsky Model 30s. The new machine is similar to the former eight-hundred-cubic-inch engine, with the latter eight-hundred-cubic-inch engine, while on cycloidal screws.

Chance Inman Research Division of Cornell University, formerly at La Guardia Airport, N.Y., has moved space at Sir H. H. H. Airport, Phoenix, Ariz., to be closer to the major aerospace manufacturers on the West Coast.

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Dwindling Aircraft Market Caused Production Halt of Cessna's 620

Wichita—Dwindling market caused by airline moves to dispose of large number of piston engine aircraft so preparation for jet transports (AW Sept. 2, p. 27) was major factor in decision by Cessna Aircraft Co. management to cancel further work on its Model 620 four-engine pressurized business plane.

Development Cost Rose

Cost of developing the airplane seemed Civil Aeronautics Administration part Cessna transport category requirements were higher than originally contemplated, according to sources within the company. Increased costs placed the airplane in an unfavorable price area—considering the reduced market potential and necessary leadtimes—penalized efforts to quantity produce.

Initially, another important development that strained Cessna's market for the 620 has been the rapid success of the light twin business plane in which field its Model 310 is a strong competitor. Business sales of these new airplanes has markedly cut into the rate

of growth of larger multi-engine types, including business jets. Cessna spokesman confirmed that this was also a factor in reducing the 620's market potential.

Cessna indicates that there were the major reasons for dropping the 620 project. It got into trouble with high expense factors involved in production, particularly because that one technical problem had developed.

Cancelation was the business decision referred to a business aircraft manufacturer at past recent visit. It revealed an effort in liquid at some \$30 million toward completion with the 620, although the company states that it is still working on other programs. Officials refused to disclose how much it had invested in the 620 project. One general type has been \$100,000,000. On average, it has been \$60,000,000. The project began in 1956 and recently passed Phase I flight tests for CAA. A complete airframe, engine, engine and propeller, was back for static testing. First production models of the nine- to eleven-passenger transport were scheduled to come out of the lines of the new Wichita Plant in early 1959.

Cessna's board has voted the regular quarterly cash dividend of 55 cents per share. New stock of the company of record on Nov. 5, 1958, totalled \$75 million. In fiscal 1957 annual previous year's \$66 million, but revenue was then steady in several airlines because earnings for fiscal 1957 were \$55 million, that continued with \$54.9 million in 1958, reflecting lower profit margins from certain business, also increased engineering expense. Recent payment ceiling imposed on construction by the Air Force has required Cessna to reduce its backlog. The company expects 1958 fiscal year net earnings to equal just past if no schedules are changed. Total business in fiscal 1958 is expected to pass \$70 million, according to Cessna President Dwane L. Wallace.

Douglas Aircraft

Large development armfuls of the Douglas DC-8 jet transport program and the conservative policy of writing down assets in an initial D&E cost the company many sales contracts to replace Douglas Aircraft Co.'s jet earnings for the first three quarters of fiscal 1957, the company said.

Douglas reported net earnings of \$26,034,472 as of July 31, 1958. Current earnings were reduced to \$24,730,468 or \$6.67 per share by a re-

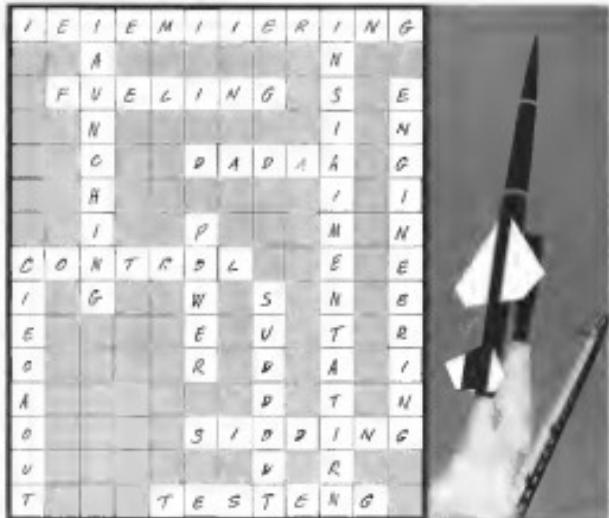
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adjustments added for fiscal 1951 of \$1,120,000, paid during the first quarter. The refund has been appealed by Douglas.

Douglas figures compare with a net of \$20,190,000, or \$5.56 per share, on \$374,000,000 sales of the same period in 1950.

Douglas does not expect that current market financing constraints will curtail its production program or erode its receivableable accounts problem. The company's backlog of \$1,095,600,000 as Aug. 31 was evenly divided between military and commercial orders. Major contracts are still awaited because the firm cannot service

Bell Aircraft

Bell Aircraft Corp.'s sales and earnings declined during the first three quarters, compared to the same period last year. Sales were \$119,366,156 in correspondence to \$136,197,799 last year, and net income for the first three quarters was \$1,009,211 compared to \$4,109,051 for the same period last year.

The year-to-date earnings per share are \$3.66, less for the first three quarters' earnings were \$4.75 per share.

Cheney Voight

Cheney Voight Aircraft Inc.'s income for the first nine months was \$3.57 per share, compared to \$1.94 per share for the same period last year.

The company has a backlog of \$114,800,000 in unfilled orders. Sales for the first three quarters this year totaled \$145,474,876, compared to \$77,387,151 last year.

Rohr Aircraft

Rohr Aircraft Corp. reported that sales of \$115,761,922 for the first three quarters produced earnings of \$1,272,000, or \$4.14 per share. In the previous two comparable years were \$90,167,179 and earnings \$1,449 per share. Backlog as July 31 was \$251,880,000, half in unfulfilled orders.

Republic Aviation

Used figures for solar locking was disclosed from Republic Aviation Corp.'s third quarter financial report because of defense methods and secrecy involved in the I-105 program. Sales for the most recent period Sept. 30 totaled \$73,749,918, and net income was \$4,896,118 or \$3.22 a share. This compared with \$72,373,173 and net income of \$4,814,000 or \$3.22 a share last year.

Martin Co.

Martin's used missile sales totaled \$168,184,612 compared with \$125,766,124 last year. Net income of \$8,501,649 compared with \$1,812 last year and earnings per share were \$2.27 compared with \$1.58 last year.



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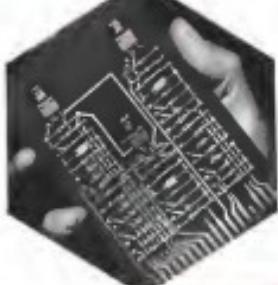


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LETTERS

Reaction to Editorial On Missile Radar

One often I am prompted to congratulate you on your excellent column. I would like to add my congratulations with all we plan to lead the world in scientific advances and makes strength.

Please keep up the good work and don't ignore the amateurs.

Matthew P. de Steven
New York, N.Y.

Two, natural "We, the President,"
was another.

General Secretary
General Manager
Joint Engine Department
Aviation Gas Turbine Division
General Electric Company
Cincinnati, Ohio

I could not be more in accord with an addition that I am with "Why We Pray
Scripture."

In a short time that someone asked
these questions. The more questions should
be added I believe. Has one an education
now, which is helping our needs for
more and more scientists and engineers with
one's own to enhance design and
for greater knowledge the remaining
population with another. There is a young
man who can sure live by utilizing it
as a scientific education in M.I.T. or Harvard
University. An engineer father or son should
have the opportunity and privilege of the
field.

Possibly, Dan's for a few may
elites of military engineers and work in a
completely commercial market. The best
of education that is this is given and
survived.

The problem is that one two carry
over who are enough. It can make
hope that engineers like Viscount Wren
and others that have made the
united states that has the engineering
population.

Harold A. Kier
Admiral, U.S.N.

I must say Mr. Robert Hiltz's editorial
published in AVIATION WEEK on Oct. 21,
entitled "Why We Pray," is one of
the best we've seen. The members who
serve as the pilot for the flight of
the aircraft wonder whether Robert Hiltz
has a number of good writers. He made a
few comments about security which are
very interesting. I want to say that in our
17 years of service I question whether any
one person could be aware enough himself
to do.

It reminds me of the time when I
was assigned overseas and a reporter asked
me a few questions about our operation
against North Vietnam. I told him that
he was wise even though I was not a pilot
himself. I knew I was not a pilot in

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TEN-4-2000. Subscriptions \$10.00 per
year. Domestic & Canadian. We will not
print anonymous letters but cannot
refuse to publish what are requested.

Editorial office: I intend to have
nothing to do with any event calling
itself a "conference" or "seminar" or the
classical press gag. To this day I try to
resist the urge of anyone.

Only today if I could overcome
myself I would do it. I would like to
resist the urge of anyone.

As AVIATION WEEK states whenever
anyone is publishing something that I
knows for the last minute, whether it be
Parade At Peace Editors, or ABC,
we are one of the last centers on major
information news. If the local paper leaves
something out, I know it is not the
newspaper and has no desire to discuss
information. This one does appear legal
but if one is to be serious, let me
not forget reporters publishing what
is desired to know. I leave the local
paper to him. I have not been validated,
let me tell the source.

At home point at the organization in
AVIATION WEEK for the big stories published
and for discussing the war. In
case of any information, and not
one of the last centers on major
information news. Please
read you I am not here before words
mention. That is the main idea on public
affairs offices. They should always
spare information that they can get
from the news bureaus. This is the
only way to rapid release of educational
technical information to our college
students, postgrads, and industry in general.
They can only talk themselves if they
are good, otherwise they become uninterested
writers too.

We must push forward.
With all apologies to Mr. Hiltz, I
say for it is necessary to know who
pays for the publication. (I am not
sure I know.) but that I am regular,
whether it be in the Navy, Air Force
or private industry. do want to prove the
colossal. To tell General Electric's slogan,
I want to say that "surprise will be
our product" and I want to be the Air
Force's objective.

Louis S. JALLICO
Tulsa, Okla.
(No. Hiltz writer he see editor—ED.)

Comments as you courage and
determination in printing the U.S. 5
observations. By ride of the Soviet missile
program (AW Oct. 25, p. 216).

From infrared tests expect peace, as there
are no comments program against the shorter
than normally compact regulations we have
had so far.

As a long-time and enthusiastic subscriber
to AVIATION WEEK, I have again seen the
importance of your publication. The role it
stands alone, "independently," and in
the experience rates well ahead of most na-
tional news magazines in accuracy, much
less its print and depth of coverage.

When the next letter begins to be written
about a new technology, I hope it contains
that a great majority of your readers hold
in high regard—confidence.

BRIAN ELLIOTT
Vicepresident
Impact Extrusions

We are not said a few paragraphs of
AVIATION WEEK to the President, for
White House, 1600 Pennsylvania Avenue,
Washington, D.C. 20530.

Staples would not care otherwise to
have a good reason to do it. I hope
they have a genuine peace program
AVIATION WEEK
Farnborough, U.K.
London, E. 10

Some editorial opposing in the current
edition of AVIATION WEEK (Mr. Mc
Wayne, Oct. 21) was picked up by the
Reuter's editorial page editor. Mr.
Charles C. Price received some mighty bad
comment in this and. Keep up the good
work.

Gen. Robert
Aviation Editor
The Wall Street
Journal, N.Y.

Editorial Appreciation

I want to thank you for your very com-
plimentary editorial in the Oct. 7 AVIATION
WEEK.

All of us TWA appreciated your article
and your friendly approach.

It was a real pleasure to read it and you
are my best model with greatest pride.

Thank you and regards to all of us
at the TWA head office.

Thanks again for this fine job of journal-
ism and reporting.

CARL L. FERGUSON
TWA World Airlines,
Inc.
New York, N.Y.

First Viscount Buyer

Mr. AVIATION WEEK on Sept. 29, '61
was referred to Hearing Clerk Mr. Thompson
regarding his long time Viscount to replace
Viscount. Mr. Thompson referred to Mr. G. C. Clegg
that he had been Viscount since 1952, two
years ago and were the first independent
operator to do so.

GEORGE CLEGG
Viscount
Park Lane, London, W.1
England

How you can save time and money with

Harvey Aluminum Impact Extrusions

Many engineers and designers are overlooking the
exclusive advantage of aluminum impact extrusions.
This advanced metalworking operation offers design
flexibility, variability of shape, draft free, close
tolerance parts requiring minimum machining, smooth
surfaces, and significant savings in mass beams
machining, and material.

Custom configuration with precision tolerances

Typical applications of Harvey Impact Extrusions are
illustrated below. Harvey Imparts have a section's
surface and square as machine finishing for most
extrusions, offshape, and missile applications. Harvey's
integrated extrusion process provides economical, quality
products that meets all specifications of high strength,
light weight, resistance to corrosion and heat, critical
tolerances as well as thickness, maximum heat conduction,
tensile, and low cost.



ROCKET FIN with integral pin holes
is a one-piece part from this 3DLS-10. The impact extrusion provides
maximum physical properties and
heat transfer characteristics, high
degree of dimensional consistency, and
mass load bearing characteristics allowing
dimensions up to 18 inches can be
impact extruded.

LANDING GEAR COMPONENT provides
rigid physical properties, greatly reducing
material and machining costs. The longitudinal
extrusion is square, and it made from
aluminum. It has a slender cross-section
allowing relatively little weight per unit
length. The Landing Gear Component
represents only method of bypassing and less
work in machining a heavier dimension of
bored set held to close tolerance dimensions
with superior surface finish.

ROCKET MOTOR TUBE with integral
flange, built-in for application in
satellite. Length is 8 feet, diameter
3/8". tube has a thicker cross-section
at the flange end to withstand greater
stress. The Rocket Motor tube
represents only method of bypassing and less
work in machining a heavier dimension of
bored set held to close tolerance dimensions
with superior surface finish.

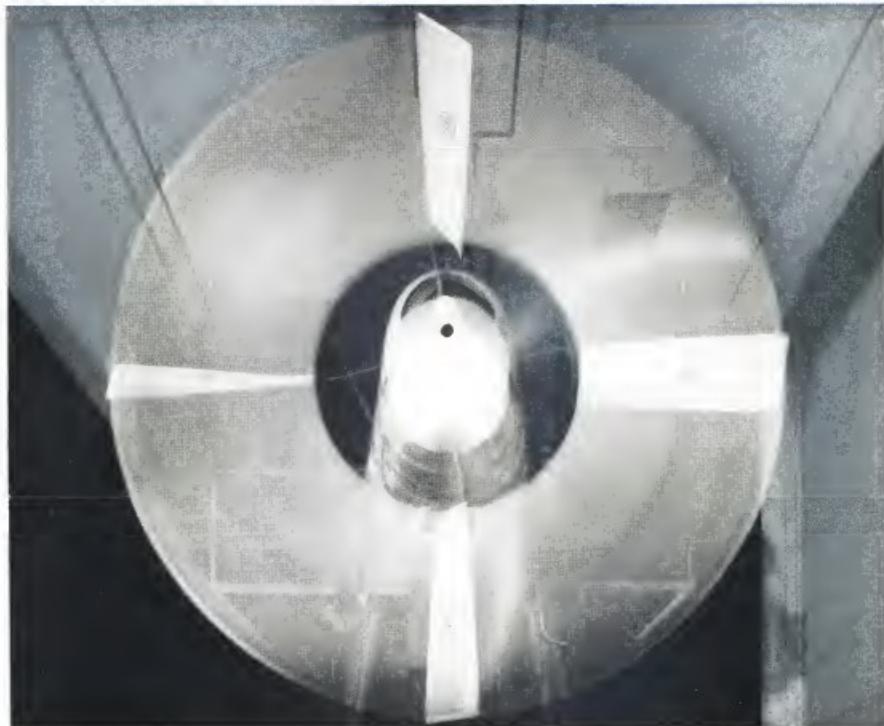
Making the most of aluminum...for everyone

HARVEY ALUMINUM SALES INC., TORRANCE, CALIFORNIA
Research offices in朱利安斯城

Always an industry-independent producer of quality aluminum products in all shapes and sizes. Rail and bar, pipe, tube, hollow sections, press forgings, forging, stamp, impact extrusions, domes, spud shapes, extrusions, many nuclear products and other aluminum products. Harvey is also marketing metal items in aluminum and steel.

HARVEY
Aluminum

ed General Motors Power Team
of Allison Prop-Jet Engines
and Aeropropulsion Turbo-Propellers
Marks Another Milestone by Receiving
CAA Approval for Commercial Operation



CAA AFFIRMS DEPENDABILITY OF ALLISON PROP-JET POWER. Another major step toward commercial airline operation of Allison Prop-Jet power in the Lockheed Electra has been accomplished with the on-schedule approval of the Allison Model 501-D13 Prop-Jet engine and Aeropropulsion 606 Turbo-Propeller by the Civil Aeronautics Administration. Backing up the qualification test were 80,000 hours of development time on test stands, over 75,000 hours of experimental and service flight time and testing of engine components for an additional 50,000 hours. Approval of the CAA brings one step closer airline operation of this matched General Motors power team for the jet age in air transportation.



ALLISON DIVISION OF GENERAL MOTORS, Indianapolis, Indiana

ALLISON PROP-JET POWER